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TRANSACTIONS

OF THE

American Orthopedic Association

Eighteenth Session

Held at Atlantic City June 8, 9, 10, 1904

VOL. XVII

AMERICAN JOURNAL OF ORTHOPEDIC SURGERY

VOL. II

Published for the Association by
P. BLAKISTON'S SON & CO.
1012 WALNUT ST., PHILADELPHIA

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1901. Bartow, Bernard, M.D. Clinical Professor Orthopedic Surgery, Medical Department, University of Buffalo; Orthopedic Surgeon, Children's Hospital; Orthopedic Surgeon, Erie County Hospital; Consulting Orthopedic Surgeon, Buffalo General Hospital. 481 Delaware Avenue, Buffalo, N.Y.

1892. Blanchard, Wallace, M.D. Attending Orthopedic Surgeon to the Home for Destitute Crippled Children. 34 E. Washington Street, Chicago.

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*1887. Bradford, E. H., M.D. Visiting Surgeon to the Children's and the Good Samaritan Hospitals; Professor of Orthopedic Surgery in Harvard Medical School. 133 Newbury Street, Boston.

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1895. Dane, John, M.D. Junior Assistant Surgeon to the Children's Hospital; Assistant Surgeon to the West End Infant Hospital. 29 Marlborough Street, Boston.

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1900. Elliott, George R., M.D. Orthopedic Surgeon to Montefiore Home for Chronic Invalids. 48 East Twenty-sixth Street, New York.

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1901. Freiberg, Albert H., M.D. Professor of Orthopedic Surgery, in the University of Cincinnati (Medical College of Ohio); Orthopedic Surgeon of the Cincinnati and Jewish Hospitals. 19 West 7th Street, Cincinnati, Ohio.

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*1887. Gibney, V. P., M.D. Clinical Professor of Orthopedic Surgery in the College of Physicians and Surgeons, Medical Department of Columbia University; Surgeon-in-chief to the New York Hospital for Ruptured and Crippled; Orthopedic Surgeon to the Nursery and Children's Hospital and to the Montefiore Home and Hospital, New York. 16 Park Avenue, New York.

*1889. Gillette, Arthur J., M.D. Professor of Orthopedic Surgery in the Minnesota State University; Orthopedic Surgeon to St. Luke's, St. Joseph's, Bethesda, City and County Hospitals, and the St. Paul Free Dispensary, and Consulting Orthopedic Surgeon to Asbury Hospital; Surgeon-in-charge of Minnesota State Hospital for Crippled and Deformed Children. 301 Pleasant Avenue, St. Paul, Minn.

1892. Goldthwait, Joel E., M.D. Orthopedic Surgeon to Carney Hospital; Consulting Orthopedic Surgeon to the Massachusetts General and the New England Hospitals. 372 Marlborough Street, Boston.

1892. Griffiths, J. D., M.D. Lieutenant Colonel and Medical Director, First Brigade, National Guard of Missouri; President of the Association of Military Surgeons of the U.S.; Surgeon to St. Joseph's Hospital, Kansas City; Consulting Surgeon to the German Hospital, Kansas City; Consulting Surgeon to the Kansas City, Fort Scott & Memphis R.R. South-west corner Ninth and Grand Avenue, Kansas City, Mo.

1898. Hoffmann, Phil., M.D. Clinical Lecturer on Orthopedic Surgery in the Medical Department, Washington University; Chief of the Orthopedic Clinic at St. John's Hospital. 3337 Washington Avenue, St. Louis, Mo.

1893. Hosmer, A. B., M.D. Orthopedic Surgeon to St. Luke's Hospital. 103 State Street, Chicago.

*1887. Judson, A. B., M.D. Orthopedic Surgeon to the Outpatient Department of the New York Hospital. 1 Madison Avenue, New York.

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*1887. Lovett, Robert W., M.D. Surgeon to the Infant's Hospital; Assistant Surgeon to the Children's Hospital; Surgeon to the Peabody Home for Crippled Children. 234 Marlborough Street, Boston.

1893. McCurdy, Stewart Le Roy, A.M., M.D. Orthopedic Surgeon to the Presbyterian Hospital; Professor of Orthopedic and Clinical Surgery, West Pennsylvania Medical College; Professor of Anatomy and Surgery, Pittsburg Dental College. 702 Empire Building, Pittsburg, Pa.

1889. McKenzie, B. E., B.A., M.D. Surgeon to the Toronto Orthopedic Hospital; Orthopedic Surgeon to the Grace General Hospital; Associate Professor of Clinical Surgery, Ontario Medical College for Women. 12 East Bloor Street, Toronto, Canada.

1901. McKim, Smith Hollins, M.D. House Surgeon to the Hospital for the Relief of Crippled and Deformed Children; Chief of Clinic to the Professor of Orthopedic Surgery, University of Maryland. 2000 N. Charles Street, Baltimore, Md.

1889. Myers, T. Halsted, M.D. Attending Orthopedic Surgeon to St. Luke's and New York Foundling Hospitals; Attending Surgeon to the New York Orthopedic Dispensary; Consulting Surgeon to St. John's Riverside Hospital, Home of the Annunciation, and New York Lying-in Hospital. 24 West Fiftieth Street, New York.

*1887. Packard, George B., M.D. Professor of Orthopedic Surgery in the Denver College of Medicine; Orthopedic Surgeon to the Arapahoe County Hospital. 732 Fourteenth Street, Denver.

1899. Painter, Charles F., M.D. Instructor in Orthopedic Surgery at Tufts Medical School; Visiting Surgeon to the House of the Good Samaritan; Assistant Orthopedic Surgeon to the Carney Hospital. 372 Marlborough Street, Boston.

*1887. Park, Roswell, M.D. Professor of Surgery in the Medical Department of the University of Buffalo; Surgeon to the Buffalo General Hospital; Consulting Surgeon to the Fitch Accident Hospital and the Buffalo Eye and Ear Infirmary. 510 Delaware Avenue, Buffalo, N.Y.

1900. Peckham, Frank E., M.D. Orthopedic Surgeon to the Rhode Island Hospital; Orthopedic Surgeon to St. Joseph's Hospital. 266 Benefit Street, Providence, R.I.

1901. Pegram, John C., Jr., M.D. Orthopedic Surgeon to St. Joseph's Hospital and to the Rhode Island Catholic Orphan Asylum; Orthopedic Surgeon to the Rhode Island Hospital; Consulting Surgeon to the Butler Hospital for the Insane; Demonstrator of Anatomy, Brown University. 277 Benefit Street, Providence, R.I.

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1901. Porter, John L., M.D. Professor of Orthopedic Surgery, College of Physicians and Surgeons (Medical School of University of Illinois); Assistant Attending Orthopedic Surgeon, Home for Destitute Crippled Children; Attending Orthopedic Surgeon, St. Luke's Dispensary. 92 State Street, Chicago.

*1887. Ridlon, John, M.D. Professor of Orthopedic Surgery in the North-western University Medical School; Senior Attending Orthopedic Surgeon to St. Luke's Hospital and Michael Reese Hospital; Orthopedic Surgeon to Wesley Hospital, Mercy Hospital, and the Evanston Hospital; Surgeon-in-charge of the Home for Destitute Crippled Children; Orthopedic Surgeon to the Chicago Hospital School. 92 State Street, Chicago.

1903. Riely, Compton, M.D. House Surgeon at the Hospital for the Relief of Crippled and Deformed Children of Baltimore; Chief of Orthopedic Clinic to the University of Maryland; Radiographer to the Maryland University Hospital. 2000 North Charles Street, Baltimore, Md.

1903. Rugh, J. Torrance, M.D., A B. Demonstrator of Orthopedic Surgery in the Jefferson Medical College; Assistant Orthopedic Surgeon to the Jefferson Medical College Hospital. 1616 Spruce Street, Philadelphia.

*1887. Sayre, Reginald H., M.D. Clinical Professor of Orthopedic Surgery in the University and Bellevue Hospital Medical College; Orthopedic Surgeon to the Outdoor Department of the Bellevue Hospital; Consulting Surgeon to the Hackensack (N.J.) Hospital; Consulting Surgeon to the Hospital for Sick Children, Newark, N.J. 9 East Forty-fifth Street, New York.

*1887. Schapps, John C., M.D. Butte, Mont.

*1887. Shaffer, Newton M., M.D. Surgeon-in-chief to the New York State Hospital for the Care of Crippled and Deformed Children; Professor of Orthopedic Surgery, Cornell University Medical College; Consulting Orthopedic Surgeon to St. Luke's and Presbyterian Hospitals; Consulting Surgeon to the New York Infirmary for Women and Children. 28 East Thirty-eighth Street, New York.

1896. Shands, A. R., M.D. Professor of Orthopedic Surgery in the Medical Department of Columbia University; Assistant Physician-in-charge of General Diseases at Emergency Hospital and Central Dispensary; Surgeon-in-charge of Orthopedic Department, Emergency Hospital and Central Dispensary; Attending Physician to Newsboys' Home and Children's Aid Society. 1319 New York Avenue, Washington, D.C.

1889. Sherman, Harry M., A.M., M.D. Orthopedic Surgeon to the Children's Hospital, San Francisco; Surgeon to

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St. Luke's Hospital, San Francisco; Professor of Surgery in the University of California. 1303 Van Ness Avenue, San Francisco.

1902. Spellissy, Joseph M., M.D. Out-patient Surgeon at the Pennsylvania Hospital; Assistant Surgeon at the Orthopedic Hospital and at the Orthopedic Department of the University Hospital; Visiting Surgeon at St. Joseph's and the Methodist Hospitals. 110 South Eighteenth Street, Philadelphia.

1900. Starr, Clarence L., M.D. Orthopedic Surgeon to Hospital for Sick Children; Registrar to Toronto General Hospital; Demonstrator of Clinical Surgery in Medical Faculty, University of Toronto. 95 Bloor Street, West, Toronto, Canada.

*1887. Steele, A. J., M.D. Professor of Orthopedic Surgery in the Medical Department of Washington University; Orthopedic Surgeon to the Missouri Baptist Sanitarium; Consulting Orthopedic Surgeon to the Martha Parsons Children's Hospital. 2825 Washington Avenue, St. Louis.

*1887. Taylor, Henry Ling, M.D. Professor of Orthopedic Surgery and Attending Surgeon to the New York Post-graduate School and Hospital; Assistant Surgeon to the Hospital for the Ruptured and Crippled; Consulting Orthopedic Surgeon to the State Epileptic Colony, Sonyea, N.Y. 125 West Fifty-eighth Street, New York.

1897. Taylor, Robert Tunstall, B.A., M.D. Surgeon-in-charge of the Hospital for Crippled Children; Clinical Professor of Orthopedic Surgery, University of Maryland; Orthopedic Surgeon to the University Hospital in Baltimore. 2000 Maryland Avenue, Baltimore, M.D.

1892. Taylor, William J., M.D. Attending Surgeon to the Orthopedic Hospital and Infirmary for Nervous Diseases and to St. Agnes Hospital; Consulting Surgeon to the West Philadelphia Hospital for Women. 1825 Pine Street, Philadelphia.

1892. Thorndike, Augustus, M.D. Surgeon to Good Samaritan Hospital; Assistant Surgeon to West End Infant Hospital and Junior Assistant Surgeon to Children's Hospital. 601 Beacon Street, Boston.

1889. Townsend, W. R., M.D. Professor of Orthopedic Surgery in the New York Polyclinic; Associate Surgeon to the Hospital for Ruptured and Crippled, New York; Visiting Surgeon to Randall's Island and Bayonne Hospitals; Consulting Orthopedic Surgeon to the French Hospital. 125 West Fifty-eighth Street, New York.

1901. Waterman, J. Hilton, M.D. Instructor in Orthopedic Surgery in the New York Polyclinic Medical School and Hospital; Clinical Assistant in the Hospital for the Relief of the Ruptured and Crippled. 50 West Fifty-first Street, New York.

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1889. Weigel, Louis A., M.D. Professor of Orthopedic Surgery in the Medical Department of Niagara University, Buffalo; Orthopedic Surgeon to Rochester City Hospital and Outpatient Department; Consulting Orthopedic Surgeon to Provident Dispensary. 209 East Avenue, Rochester, N.Y.

1890. Whitman, Royal, M.D. Instructor in Orthopedic Surgery and Chief of the Orthopedic Division of the Vanderbilt Clinic in the College of Physicians and Surgeons; Adjunct Professor of Orthopedic Surgery in the New York Polyclinic; Associate Surgeon to the Hospital for Ruptured and Crippled, New York. 283 Lexington Avenue, New York.

*1887. Willard, De Forest, M.D. Professor of Orthopedic Surgery in the University of Pennsylvania; Surgeon to the Presbyterian Hospital; Consulting Surgeon to the White Cripples' Home, the Colored Cripples' Home, and the Home for Incurables, Philadelphia; Consulting Surgeon to the New Jersey State School for Feeble-minded Children. 1818 Chestnut Street, Philadelphia.

1899. Wilson, C. W., M.D., C.M., M.R.C.S. Eng. Assistant Surgeon to Montreal General Hospital; Orthopedic Clinic, Post-graduate Course, McGill University; Lieutenant Colonel, Army Medical Staff, Canada. 55 Union Avenue, Montreal.

1891. Wilson, H. Augustus, M.D. Professor of Orthopedic Surgery in the Jefferson Medical College; Emeritus Professor of Orthopedic Surgery in the Philadelphia Polyclinic; Orthopedic Surgeon to the Philadelphia Hospital; Consulting Orthopedic Surgeon to the Kensington Hospital for Women and to the Philadelphia Lying-in Charity. 1611 Spruce Street, Philadelphia.

1890. Young, James K., M.D. Professor of Orthopedic Surgery, Philadelphia Polyclinic; Clinical Professor of Orthopedic Surgery in the Woman's Medical College; Assistant Orthopedic Surgeon to the Hospital, University of Pennsylvania; Instructor in Orthopedics in University of Pennsylvania; Surgeon to the Home for Crippled Children; Orthopedic Surgeon, Hospital of the Good Shepherd, Radnor. 222 South Sixteenth Street, Philadelphia.

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1897. BENJAMIN LEE, M.D., Secretary of the State Board of Health of Pennsylvania. Crozer Building, 1420 Chestnut Street, Philadelphia, Pa.

1890. WILLIAM MACEWEN, M.D., LL.D., Professor of Clinical Surgery and Surgeon to the Glasgow Royal Infirmary; Surgeon to the Royal Hospital for Sick Children. 3 Woodside Crescent, Glasgow, Scotland.

1900. JAMES E. MOORE, M.D., Professor of Clinical Surgery and Orthopedic Surgery in the University of Minnesota; Orthopedic Surgeon to St. Mary's Hospital; Consulting Surgeon to the North-western Hospital for Women and Children. 802 Dayton Building, Minneapolis, Minn.

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ELECTED

1892. Dr. M. BILHAUT, Rédacteur en Chef des Annales d'Orthopédie et de Chirurgie pratiques; Chirurgien des Enfants de l'Hôpital International. 5 Avenue de l'Opéra, Paris, France.

1903. A. CODIVILLA, M.D., Professore incaricato di Ortopedia nella R. Università, Direttore dell' "Istituto Ortopedico Rizzoli, zu Bologna."

1894. Dr. JULIUS DOLLINGER, ausserordentlich-öffentlicher Professor für Orthopädie an den königl. ungarischen Universität in Buda-Pest, Operateur und dirigirender Oberarzt der chir. Abtheilung im Spitalls der Barmherzigen Brüder in Buda-Pest; Mitglied des Landessanitätsrathes; Mitglied des Landesunterrichtsrathes; Mitglied mehrer wissenschaftlichen Gesellschaften und Vereine. Buda-Pest (Ungarn), Rerepescher Str. 52.

1890. Dr. A. HOFFA, Geh. Medicinalrath, a. o. Professor an der Universität Berlin; Correspondirendes Mitglied der Société de Pédiatrie de Paris. Achenbachstr. 16, Berlin.

1890. ROBERT JONES, F.R.C.S. Edin., Honorary Surgeon, Royal Southern Hospital. 11 Nelson Street, Great George Square, Liverpool, England.

1899. C. B. KEETLEY, F.R.C.S. Eng., Senior Surgeon to the West London Hospital; Hon. Treasurer British Orthopedic Society. 56 Grosvenor Street, W., London, Eng.

1890. Dr. E. KIRMISSON, Professeur agrégé de la Faculté de Médecine; Chirurgien de l'Hôpital des Enfants Assistés. 27 Quai d'Orsay, Paris, France.

1890. Dr. SIGFRIED LEVY, Superintending Surgeon of the Society for the Relief of Crippled and Mutilated Children, Copenhagen. 135 Gothersgade, Copenhagen, Denmark.

1892. ERNEST MUIRHEAD LITTLE, F.R.C.S. Eng., Surgeon to the National Orthopedic Hospital. 40 Seymour Street, Portman Square, London, England.

1889. Dr. ADOLF LORENZ. IX. Garnisongasse 3 (Garellihoff), Vienna, Austria.

1889. HOWARD MARSH, F.R.C.S. Eng., Senior Assistant Surgeon and Lecturer on Surgery, St. Bartholomew's Hospital; Consulting Surgeon, Hospital for Sick Chil-

ELECTED

dren and Alexandra Hospital for Hip Disease. 30 Bruton Street, W., London, England.

1890. EDMUND OWEN, M.B., F.R.C.S., Surgeon to and Joint Lecturer on Surgery at St. Mary's Hospital; Senior Surgeon to the Hospital for Sick Children, Great Ormond Street. 64 Great Cumberland Place, W., London, England.

1892. ROBERT WILLIAM PARKER, M.R.C.S. Eng., Senior Surgeon, East London Hospital for Children; Surgeon, German Hospital, Dalston. 13 Welbeck Street, W., London, England.

1890. PAUL REDARD, M.D., Lauréat de l'Institute; Ancien Chef de Clinique chirurgicale de la Faculté de Médecine de Paris; Chirurgien du Dispensaire Furtado-Heine. 3 Rue de Turin, Paris, France.

1888. BERNARD ROTH, F.R.C.S. Eng., Orthopedic Surgeon to the Royal Alexandra Children's Hospital, Brighton. 38 Harley Street, Cavendish Square, W., London, England.

1903. W. SCHULTHESS, M.D., Privatdozent für Orthopädie; Chefarzt am Diakonissenhause, Neumünster. Neumünsterallee 3, Zürich V., Switzerland.

1890. NOBLE SMITH, F.R.C.S. Edin., L.R.C.P. Lond., M.R.C.S. Eng., M.D., Surgeon to All Saints' Children's Hospital; Orthopedic Surgeon to British Home for Incurables; Senior Surgeon to the City Orthopedic Hospital. 24 Queen Anne Street, Cavendish Square, W., London, England.

1899. ALFRED H. TUBBY, M.S., M.B. Lond., F.R.C.S. Eng., Surgeon to the Westminster, National Orthopedic, and Evelina Hospitals. 25 Weymouth Street, Portland Place, W., London, England.

1899. OSCAR VULPIUS, Privatdozent der Chirurgie an der Universität Heidelberg, Dozent für orthopädische Chirurgie, dirigirender Arzt der Orthopädische Chirurgischen Heilanstalt in Heidelberg. Luisenstrasse No. 1.

1890. GEORGE ARTHUR WRIGHT, B.A., M.B., Oxon., F.R.C.S., Senior Assistant Surgeon, Royal Infirmary, Manchester; Surgeon to Children's Hospital, Pendlebury and Manchester. 8A St. John Street, Manchester, England.

1904. L. WULLSTEIN, M.D., Privatdozent Assistenarzt an der Königl. Chirurgischen Univ. Klinik zu Halle a. S.

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1887.	Harry Hodgen, M.D.
1887.	Samuel Ketch, M.D.
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1887.	Lewis Hall Sayre, M.D.
1899.	W. Barton Hopkins, M.D.

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1893.	Leopold Ollier, M.D.
1889.	David Prince, M.D.
1889.	Lewis A. Sayre, M.D.
1891.	C. Fayette Taylor, M.D.
1899.	Edmund Andrews, M.D.

Corresponding Members.

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1894.	Bernard E. Brodhurst, F.R.C.S. Eng.
1892.	Nicholas Grattan, F.R.C.S. Edin.
1892.	Pietro Panzeri, M.D.
1890.	Hugh Owen Thomas, M.R.C.S. Eng.
1890.	W. J. Walsham, F.R.C.S. Eng., C.M. Aberdeen.

VOLUME II. AUGUST, 1904. NUMBER 1.

8976

The American Journal *of* Orthopedic Surgery

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I.

THE PRESIDENT'S ADDRESS.

REGINALD H. SAYRE, M.D., NEW YORK.

Fellows of the American Orthopedic Association,—I wish to express to you the gratification I feel at the honor you have conferred upon me, and to extend to you my thanks for the hearty manner in which you have responded to my request for papers. There has been so much excellent matter offered for consideration that your President has been compelled to adhere to the rule passed by you some years ago, that only those papers should be placed on the programme which, together with an abstract of their contents, were in his hands six weeks preceding the meeting; and, even with the enforcement of this rule, our time will be so fully occupied that it is doubtful whether we shall be able to finish all the work that lies before us. It is partly for this reason, therefore, that I have sent word to the Fellows that only those papers can be presented which have been placed in the hands of the Secretary at the commencement of the meeting, and which are ready for the press. Another reason for this action lies in the requirements of the *Journal.*

Last year you decided to omit the publication of the Transactions as heretofore issued, and in their place to publish a quarterly journal.

You have all received the numbers of this *Journal* as they

Presented at the eighteenth annual meeting of the Association at Atlantic City, N.J., June 8-10, 1904.

were issued; and the Publication Committee now has ready for distribution the first volume, bound uniform with the Transactions of former years, so that we have practically our work presented to us as of old, with the advantage of receiving most of it much earlier than under the old system, and having added to it abstracts of work going on in other parts of the world.

The first number of this *Journal* should appear within a month after our adjournment, and contain some of the more important papers presented at the meeting. To do this, the papers must be in the hands of the Publication Committee at the close of the meeting, and in a condition to be sent immediately to the printer. The only way to accomplish this result is to require that all papers presented before our body should comply with these conditions; and I feel confident that you will support me in this position, and make a point of having your articles completely finished before the opening of the meeting.

During the past year two of our members have died. William Barton Hopkins died suddenly at his residence on May 4, 1904, of an acute gastro-intestinal attack which re-excited a nephritis of long standing, in consequence of which he rapidly lapsed into uræmic coma, from which he never rallied. He was graduated in medicine in 1874, from the University of Pennsylvania. Dr. Hopkins was the son of James Hopkins. His mother was Miss Cox, of New York. He was the grandson of Dr. Samuel Hopkins and the grand-nephew of Dr. John Rhea Barton. He was surgeon to the Pennsylvania Hospital and to the Orthopedic Hospital and Infirmary for Nervous Diseases, and was formerly surgeon to the Episcopal Hospital, where he served faithfully for many years. He published many valuable articles, and his book on Fractures has been widely read.

William Johnson Walsham, one of our Corresponding Members, died last October. Having been made a Bachelor in Medicine and Master in Surgery in the University of Aberdeen in 1871, he studied at St. Bartholomew's Hospital, London, and became a member of the Royal College of Surgeons of England in the same year, being made a Fellow in 1875. After having served as Demonstrator of Practical Surgery in St.

Bartholomew's Hospital, he was made Lecturer on Anatomy and Demonstrator of Orthopedic Surgery. He was the author of a volume entitled "Surgery: Its Theory and Practice," and contributed numerous articles to Treves's "Manual of Surgery," as well as a large number of papers on Lateral Curvature and Club-foot to the medical journals.

When Andry in 1741 defined orthopedics as the "art of preventing and correcting deformities in children," he builded better than he knew; but it is to be feared that part of his definition, and to my own mind the more important part of it, has been lost sight of by many of us.

The art of preventing deformities is a more important and a more successful one than that of correcting them; and yet how seldom we hear of it, and how insignificant a part it occupies in most of our orthopedic text-books.

It is true that at present the orthopedic surgeon sees a far smaller number of neglected deformities than used to be brought to his notice, but it is still true that the larger part of the work of most orthopedists consists in endeavoring to correct deformities which should never have been allowed to occur.

The important question of the present day is preventive medicine, and preventive surgery should go hand in hand with it.

Preventive orthopedics has not received the attention its importance demands. We have been content to go on year after year trying to correct all manner of deformities, many of which from their very nature can at best be ameliorated, but never cured, and have done but little to teach the medical profession that early diagnosis is the secret of success in the treatment of deformities. We have been so timid in our statements as to the responsibility which should rest on the shoulders of those who fail to recognize the onset of the insiduous maladies which produce these distortions that comparatively little attention is paid to our utterances.

A few years ago appendicitis was not recognized, as a rule, until the patient was in a semi-moribund condition; but now, thanks to the vigorous stand taken by a few bold abdominal surgeons, and the frank statements they have made as to the criminal carelessness of those who delay calling in aid until the time for help has passed, there are very few cases which go unrecognized, and the results of the operating table show how many lives have been saved by prompt surgical intervention.

Orthopedic cases do not present the same spectacular aspect that is exhibited by acute surgery; but the cripple who passes through life the cynosure of curious eyes, and whose sensitive feelings are wounded countless times each day, feels, and justly feels, bitter toward those whose ignorance has allowed the precious weeks and months to slip by, while assuring the parents that the child would grow out of its lateral curvature, or that the tenderness of an inflamed joint was caused by growing pains and not worthy of consideration.

We have as yet not realized the importance of the relation in which we stand to the general practitioner as teachers, and we have not been energetic enough in explaining to the profession as a whole the necessity of recognizing the underlying causes that produce the various deformities which they afterwards send to us for treatment, in order that they may institute those changes in the diet of the patient or his mode of living or the environment that may be necessary to prevent these deformities from developing.

The orthopedic surgeon is a specialist, but he is a specialist who should be expert in many branches that are recognized as specialities in themselves. Shall he limit himself merely to the straightening of rachitic deformities, and not make himself familiar with the causes that produce these deformities? He must recognize that the pigeon-toe which is brought to him for correction is often but an unconscious effort on the part of the child to relieve the strain placed on its faulty foot, and that efforts should be made to secure proper nutrition, with its improved bone growth, rather than to alter the position of the foot by mechanical means.

In the same way he must instruct the neurologist to guard against those post-paralytic deformities which are so stubborn, and urge him to see that treatment is begun in these cases before the bones have become distorted by long-continued irregular muscular action in certain directions, and unopposed by the normal counteracting force of the muscles which have become paralyzed.

He should be so observant as never to fail to detect an abnormality of vision in a case of lateral curvature and to send it to a competent ophthalmologist for correction of the error before endeavoring to straighten the spine.

He should be an educator, and should preach from the housetop the fact that habits in children always result from a definite cause, and should urge the physician invariably to investigate the underlying cause of the habit which has attracted his attention. By following this course, he will prevent the occurrence of many deformities and discover many diseases in their incipient stages, when alone it is possible to effect perfect cures.

Not alone to the doctor must he act as instructor, but to the public as well. He must teach the shoemaker how to construct shoes, and educate public opinion to know that deformed feet are not beautiful, and that shoes should be constructed in accordance with the normal shape of the foot; and this principle, to be of use, must be carried out in constructing the footgear of the infant as well as the adult.

He must teach our teachers what kind of desks the pupils should use in our schools, and convince them that the system of allotting seats in accordance with a child's mental development, without reference to its size, is altogether pernicious. He also must impress on our public educators that there is very little use in developing the mind, if it is done at the expense of so much wear and tear of the nervous system that the body which is to be controlled by this mind becomes a physical wreck.

It gives me pleasure to note that of late years a good deal of progress has been made along these lines, and that last year in Philadelphia the teachers of the public schools were given a series of lectures by various prominent specialists on the dangers against which they should guard their pupils as to their eyes, ears, nervous system, spine, etc. But it is not the lay teachers that need instruction: it is the physicians and the teaching physicians. In all our medical colleges, physiology and hygiene are taught; and at the same time in most of them a curriculum is in force that sets at defiance many of the most stringent laws of these important sciences, and yet no one raises his voice in protest, or, if he does, it is in a half-hearted way that does not carry conviction to his auditors, and leaves them in doubt whether it is really a serious matter, after all.

Among the Transactions of our Association, which comprise almost all there is of American orthopedic literature during the past fifteen years, will be found a number of scientific investigations undertaken with the object of discovering the causes of some of the diseases and deformities which fall under our notice. Many of these laboratory studies have been of great use in clearing up various doubtful points, and have given us data on which to base principles of treatment which are yielding constantly improving results. The number of colleges in which orthopedic surgery is taught has increased from one to twenty-five, as was told you by my predecessors some years ago. As a natural consequence, the number of graduates who receive sound orthopedic instruction is increasing every year; but I feel that we should not limit our efforts to instructing the undergraduates, we should try to instill into the mind of every physician the importance of the statements which I have just uttered. We all realize their truth, and take it for granted that every one else is equally convinced, while a week's record in the office of any one of us would show how mistaken is this estimate, and how few are competent to make an orthopedic diagnosis until the disease is so glaringly manifest as to force itself upon parents as well as physicians.

At the International Medical Congress held in Madrid last year I even heard an orthopedic surgeon advocate doing nothing with infantile club-foot during the first six months, as it might happen to get well by itself. Can we expect intelligence from others when those who devote themselves especially to the study of deformities give expression to such unwarranted statements?

If we are to teach others, we must understand thoroughly ourselves the real causes which produce each deformity which we are endeavoring to correct. At present we are in doubt as to many of these. In regard to some there are almost as many opinions as there are members of the Association as to what really is at the basis of the trouble, as, for example, lateral curvature of the spine. Where there are so many varying opinions, it is probable that no one holds all the truth; and it must be the future work of this Association to untangle the skein and follow its windings to the starting-point, and, having found out the truth in regard to the various deformities which we are combating, to impress ourselves with so much force on the profession at large that there shall be no further excuse for ignorance in orthopedic matters, and early diagnosis shall be as common as it is now infrequent, and not until we have done this shall we take the position in the medical world that our specialty demands.

In many parts of Europe the orthopedist is synonymous with the instrument maker, and has the same relation to the man whom we in this country understand as an orthopedist as the oculist bears to the ophthalmologist.

This is so invariably when the man who makes the diagnosis is incapable of directing the treatment, and the man who devises the apparatus is a mechanic, and not an educated surgeon. Until the surgeon knows how to adapt mechanical principles to the cure of deformities, he is not competent to be an orthopedist; and until he can both discern the cause and apply the remedy, whether it be by dietetic, instrumental, or surgical means, he is not fully equipped for his work, and deserves to fail of recognition at the hands of his confrères.

This country was the first to teach orthopedic surgery as a specialty, and it is in this country that it has found its highest development.

Let it be the aim of this society to advance the scientific investigations of the very complex problems with which we are confronted in the future as it has in the past, and we may then rest assured that our labors have not been in vain.

II.

THE TECHNIQUE OF NEUROPLASTY.

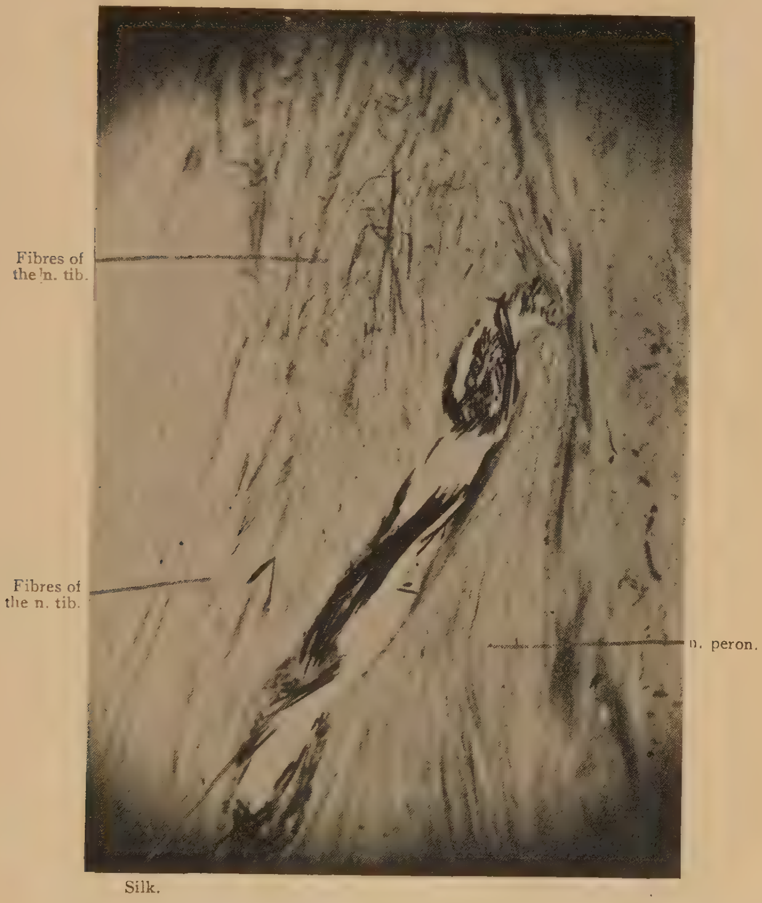
HANS SPITZY, M.D., GRAZ, AUSTRIA.

Gentlemen,—Have you not all had feelings of regret when, in the case of an extensive plastic operation on the tendons, so much muscle-material had to be removed as unserviceable, and when, moreover, it was found necessary to split off parts from the remaining intact muscle-attachments, in order to replace, to some extent, the paralyzed ones? Therefore, this feeling is all the more justified as we know that these muscles are only secondarily diseased, that they were only wasting in consequence of the separation from the nervous centre. And, if we succeeded in re-establishing this connection with the centre, or to conduct in any other way the excitation emanating from the latter which is necessary for the life of the muscle, it ought to be possible to reanimate the muscle-substance, so that it can reassume its activity; for recent as well as old studies, and many practical experiments, have established the uncontestable fact that muscles which have been in a state of atrophy for many years may be regenerated.

Traumatic interruptions in the conductibility of a nerve have been remedied for a long time past already by primary and secondary nerve-suture. Neurobiological researches have shown for a certainty that nerves may be reunited, be it, as is presumed, that the peripheral part is regenerated or grows from the centre, or that there is, as shown by the latest experiments, a *secunda* intention of the regenerated fibre (*Bethe*). If the injury which causes the paralysis lies in an inaccessible place, or in the central nervous system itself, the muscles in the paralyzed area can only be made active if they are artificially connected to the construction-system of a neighboring intact nerve.

Presented by invitation at the eighteenth annual meeting of the Association at Atlantic City, N.J., June 8-10, 1904.

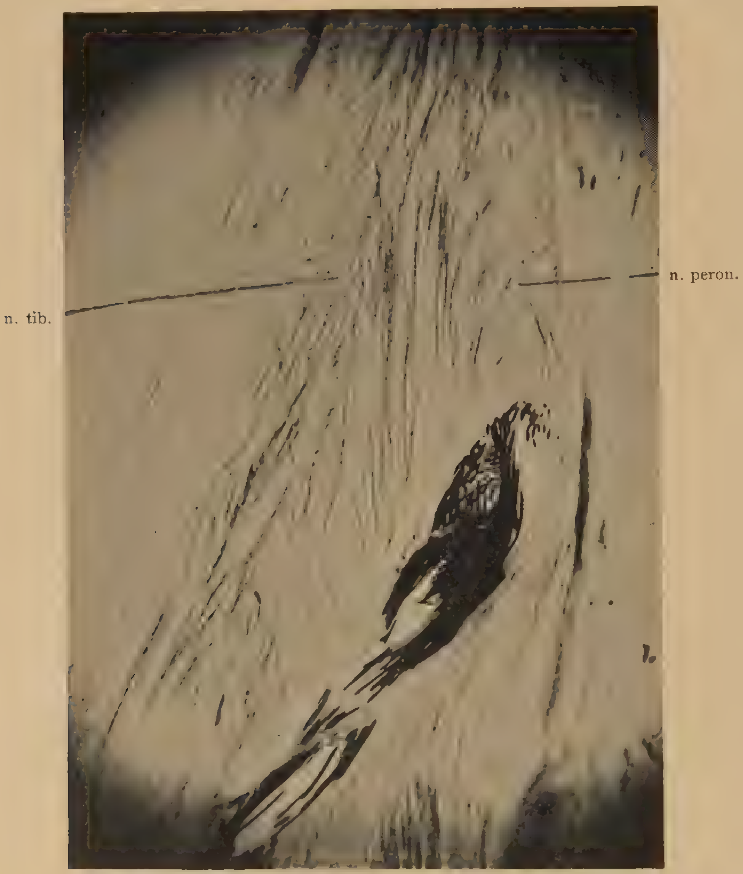
Now experiments on animals, as well as a few operations on man, have proved that it is possible to successfully establish a reciprocal connection between two different nerves.



LONGITUDINAL SECTIONS AT THE POINT OF TRANSPLANTATION OF THE N. TIB. INTO THE N. PERON.
(Enlargement 75.)

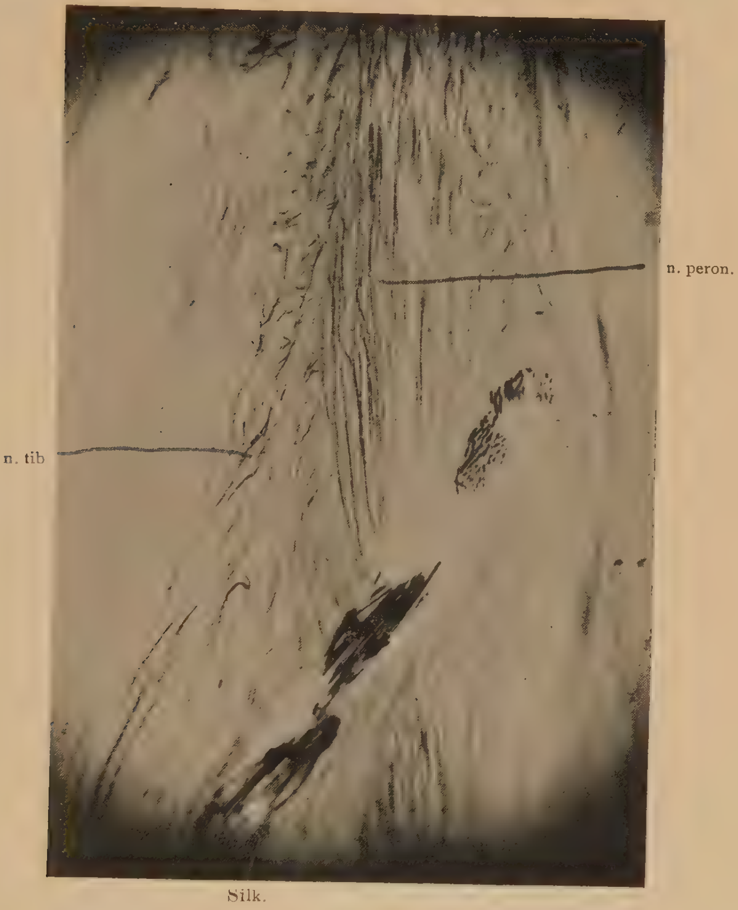
Transposition of nerves of entirely different value have already been forced,—for instance, that of the hypoglossus and vagus. Splitting and grafting of nerves have been performed on man, in some cases with satisfactory results.

My experiments are chiefly directed to sift the methods in use at the present time, to find out the kinds of paralysis most frequently observed, and the most favorable method of correcting the same, and especially to see what technique is to be adopted.



Longitudinal Sections at the Point of Transplantation of the N. Tib. into the N. Peron.
(Enlargement 75.)

At the beginning I used rabbits, but I soon discovered that these animals are very little suited for this purpose. The extremities artificially paralyzed by severing the nerve showed at once traces of decubitus, owing to the sitting mode of life of the animal; and on account of the subsequent suppuration they, as a rule, died before the time required for the regeneration had passed.



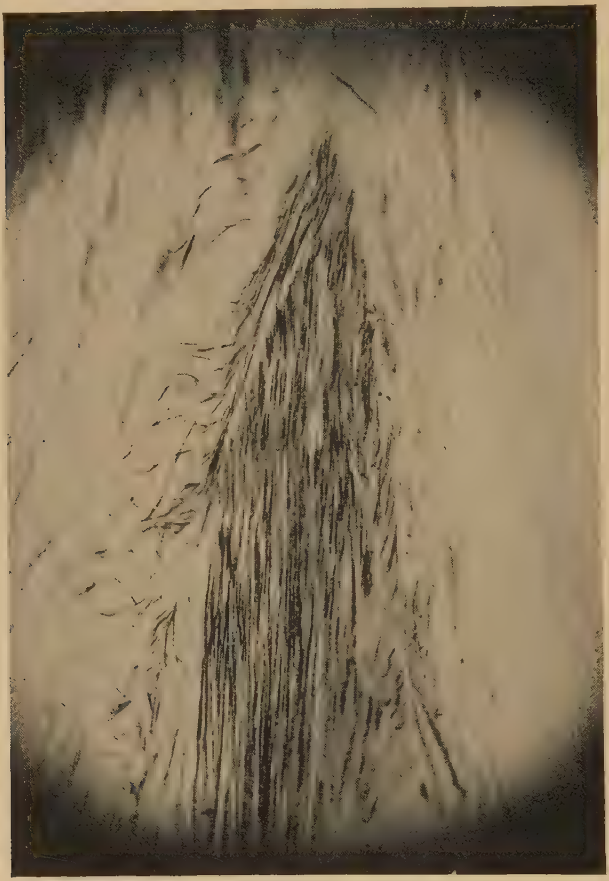
Longitudinal Sections at the Point of Transplantation of the N. Tib. into the N. Peron.
(Enlargement 75.)

With dogs, matters were in this respect far more favorable. The results were without any exception as expected and desired.

The first rule is the most scrupulous asepsis, and an exceedingly exact closing of the incision, as a further bandage is impossible.

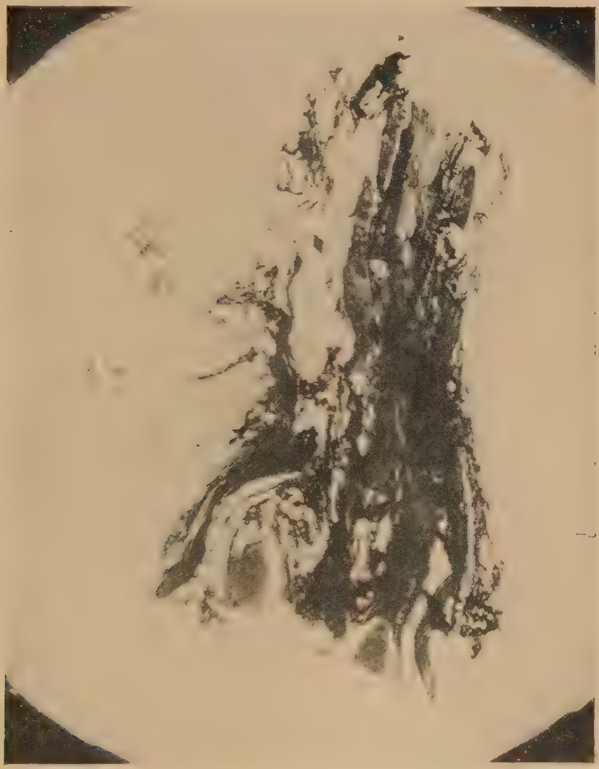
The first experiment consisted, on account of the easy accessibility, in grafting the n. peroneus on the n. tibialis.

On a dog three years old the n. ischiadicus was laid bare by a longitudinal section under an ether-morphium narcosis, and also the terminal branches of the same, the n. tibialis and n. peroneus. The latter being cut two centimetres below its origin, the central part I turned back upwards, and sewed it into the neighboring musculus biceps. Thereupon a longi-



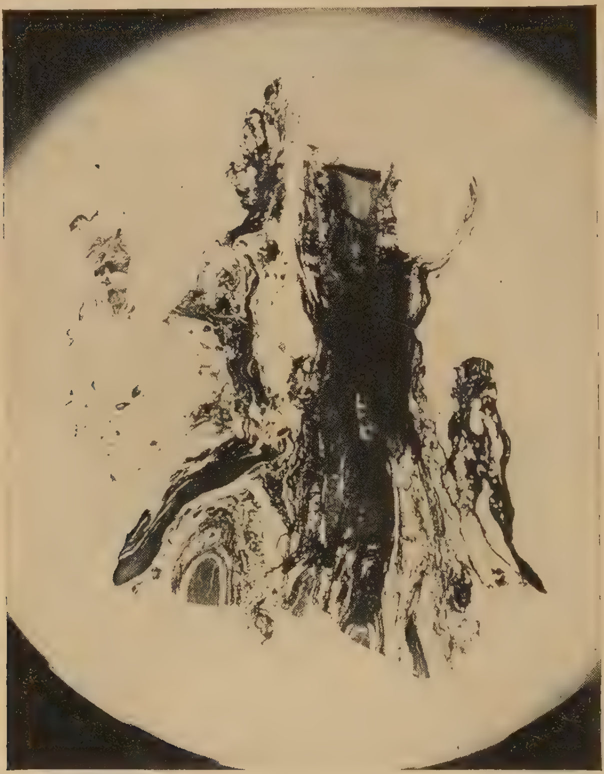
Longitudinal Sections at the Point of Transplantation of the N. Tib. into the N. Peron.
(Enlargement 75.)

tudinal slit was made in the n. tibialis by separating its fibres with a pointed instrument into which the peripheral stub of the peroneus was drawn, and fixed by a longitudinal suture passing through both nerves. The wound was closed by an exact suture and collodium bandage.



LAENGSSCHNITTE DURCH DIE IMPLANTATIONSSTELLE DES N. PERON. IN DEN N. TIB. DES HUNDES.
(Reichert, Projectionsobjectiv 70 mm. Vergrösserung 6, 5.)

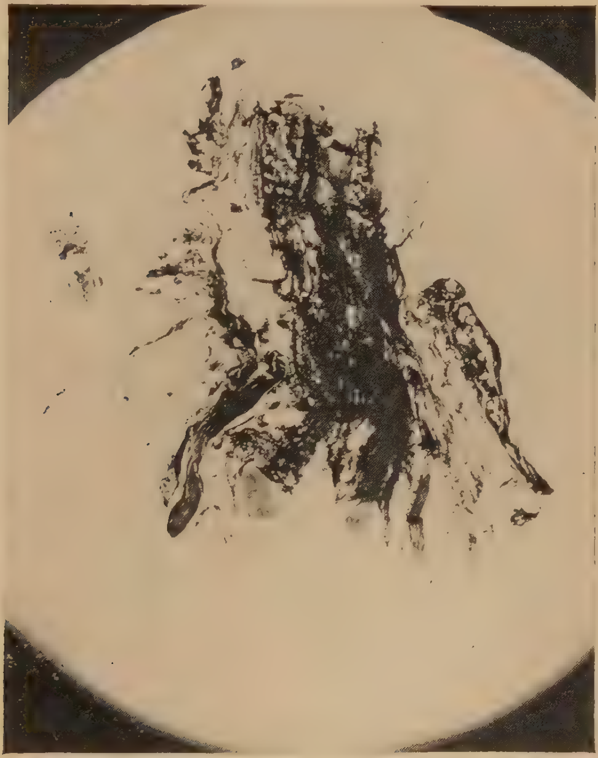
The first time the dog kept the paw contracted, the tensor-muscles on being touched felt loose or relaxed; and only on the application of strong currents a twitching was seen. This state lasted for about two months. At the end of the second month he began to gently put down the leg without resting on it. This cautious lame gait lasted up to the middle of the third month, but the ability to move the leg and to stand on it increased very noticeably; and, when I, at the end of the third month, undertook the same operation on the other leg, the dog was compelled to use the leg first operated upon for walking and standing on it, which he was able to do at once. In the fourth month no difference was noticed between this and a sound leg. The tone of the muscles and their electric excitability had reappeared, as well as the co-ordination in the movements.



Laengsschnitte durch die Implantationsstelle des N. Peron. in den N. Tib. des Hundes.
(Reichert, Projectionsobjectiv 70 mm. Vergrösserung 6, 5.)

At the beginning of the fifth month the wound was opened again, the region of the implantation was imbedded in fat, also the turned-up part of the central peroneus was distinctly visible, and no trace of the union of the latter with the implantation-spot could be noticed.

Now the nerves were excitated mechanically and electrically in the following succession:—



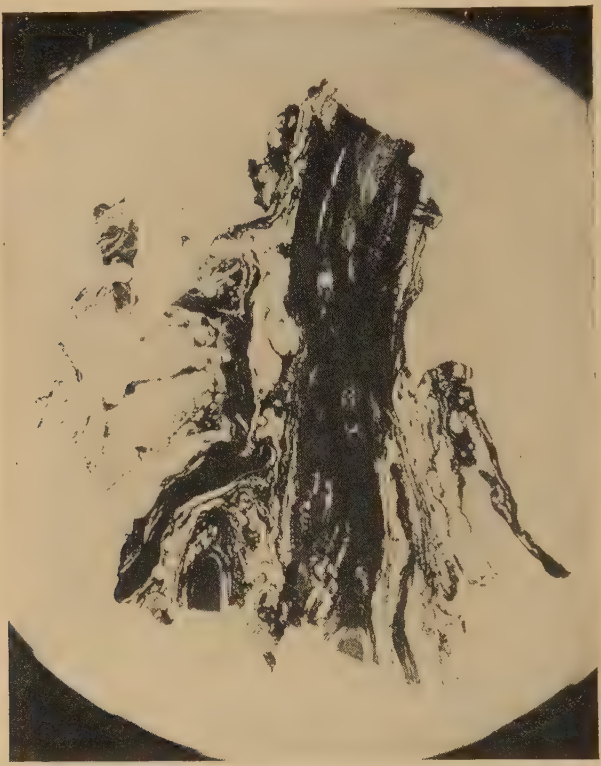
Laengsschnitte durch die Implantationsstelle des N. Peron. in den N. Tib. des Hundes.
(Reichert, Projectionsobjectiv 70 mm. Vergrösserung 6, 5.)

(1) On an excitation of the ischiadicus or the n. tibialis central from the implantation-spot there is always a twitching in the peroneus and tibialis region.

(2) On excitation of the tibialis peripherally from the implantation-spot there is a twitching of the muscles of the tibialis.

(3) On excitation of the peroneus peripherally from the implantation-spot there is a twitching in the region of the peroneus and a gentle simultaneous twitching in the region of the tibialis.

As it might still be said here that the excitation is conducted from the tibialis to the peroneus through anastomoses or new nerve-conduits, the n. tibialis was cut 1 centimetre peripherally from the implantation-spot.

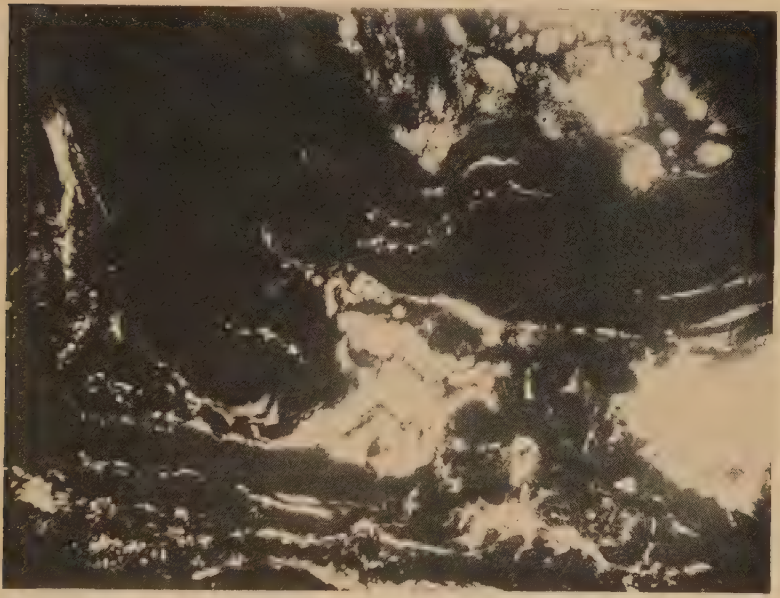


LAENGSSCHNITTE DURCH DIE IMPLANTATIONSSTELLE DES N. PERON. IN DEN N. TIB. DES HUNDES.
(Reichert, Projectionsobjectiv 70 mm. Vergrösserung 6, 5)

(4) Excitation of the tibialis central of the implantation-spot caused now a twitching only in the region of the peroneus. There is thus given an undoubtful physiological proof of the new nerve-conduit.

The anatomical-histological proof was supplied by a physiological tension of the implantation-spot, the preparation was hardened in sublimate, cut in paraffine, and colored according to Paal.

On some of the sections there could be distinctly seen the passing of nerve-fibres from the stem of the tibialis into the implanted peripheral stub of the peroneus.

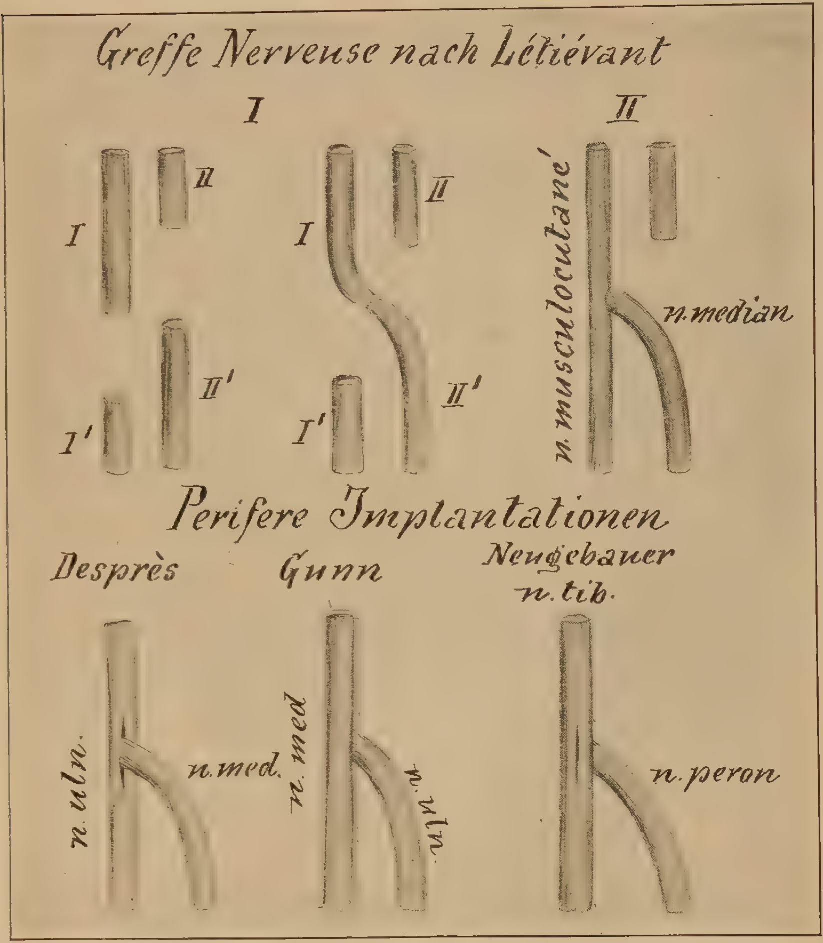


Laengsschnitte durch die Implantationsstelle des N. Peron. in den N. Tib. des Hundes.
(Reichert, Objectiv N3 ohne Okular Vergrösserung 53.)
Färbung nach Pal.

More beautiful pictures were given by a second case of a grafting of the n. tibialis in a longitudinal incision of the n. peroneus.

The operation-method, the time required for the cure, is the same as before, also the anatomical and physiological examination showed the same result.

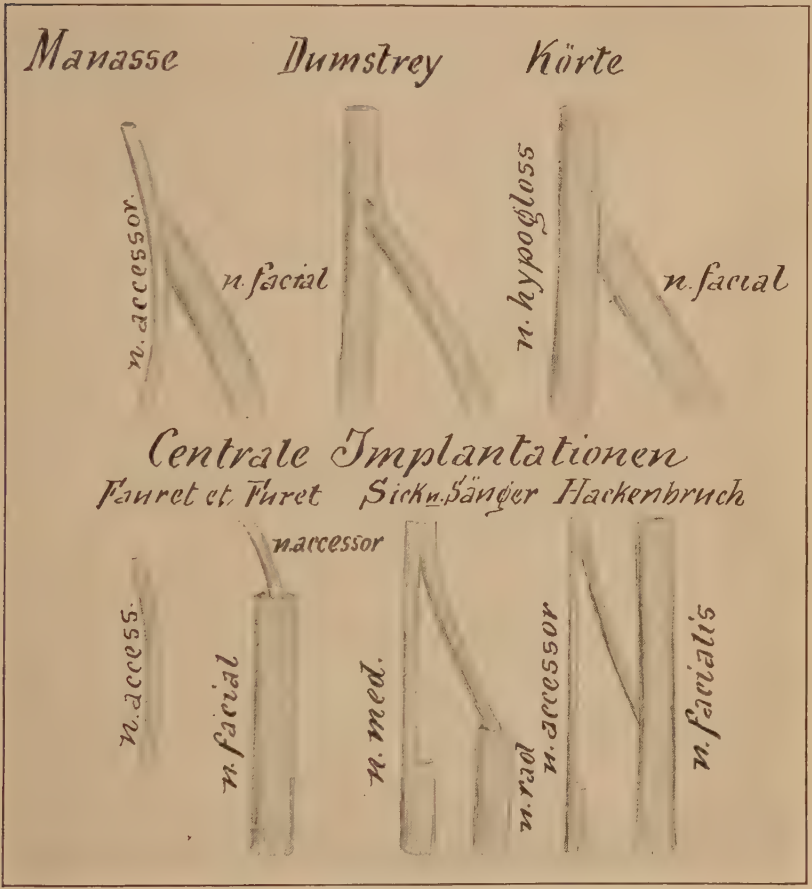
The microphotographs of the cuts showed a direct passage of nerve-fibres from the peroneus into the tibialis. In the whole tibialis there are, besides the old axial cylinders falling off in scales, new regenerated ones, not equally thick in all parts, but to be found everywhere,—a proof that the n. peroneus,


Greffe Nerveuse nach Létiévant
I
II
I
II
I'
II'
I
II
I'
II'
n. musculocutané
n. median
Perifere Implantationen
Desprès
Gunn
Neugebauer
n. tib.
n. uln.
n. med.
n. med
n. uln.
n. peron

which is of a much smaller cross-section, was equally able (all the same) to neurotize the by far larger nerve.

At another time two new-born dogs of the same litter were taken. With one of them the implantation of the peroneus into the tibialis was carried out in the above-described manner, on the other a piece of the peroneus was cut out.

After two months the first dog began to put down his paw quite perfectly, while on dog No. 2 a large decubitus, covering the whole back of the paw, showed itself, being caused by the dog constantly trailing the paw, owing to the complete paralysis of the dorsal flectors. While dog 2 thus showed the symptoms of a paralysis of the peroneus, the other was nearly normal again as a result of the plastic.

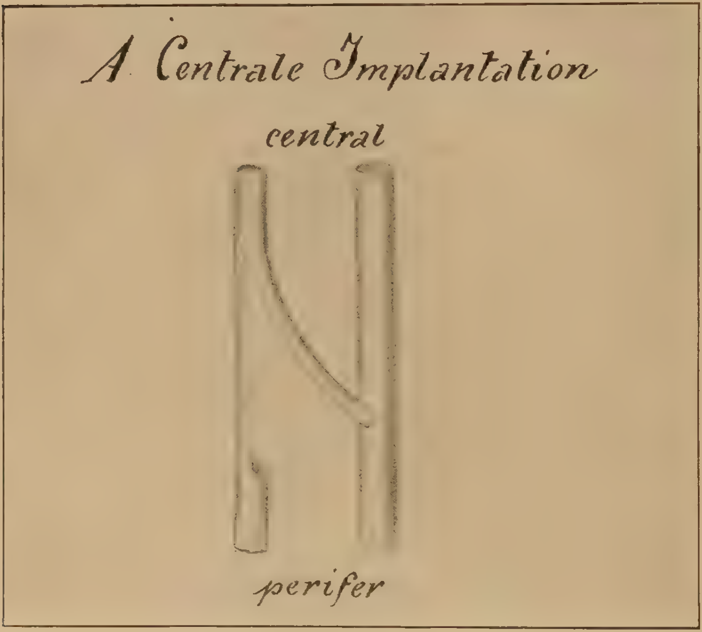

Manasse
Dumstrey
Körte
n. accessor.
n. facial
n. hypogloss
n. facial
Centrale Implantationen
Fauret et Furet
Sick u. Sänger
Hackenbruch
n. accessor
n. access.
n. facial
n. med.
n. rad
n. accessor
n. facialis

The nerve-plastic performed on man up to the present, has been especially of late on account of the paralysis of the n. facialis.

From my already mentioned experiments with animals and from the comparison of the operating methods of other authors the following may be said with regard to the principle of nerve-plastic:—

To connect the innervation-region of a paralyzed nerve with the course of an intact one, there are two different ways:—

(*a*) Either a part with a central basis is split off from the intact nerve, and this part implanted into a longitudinal slit of the paralyzed nerve and fixed by a longitudinal cut (central implantation),

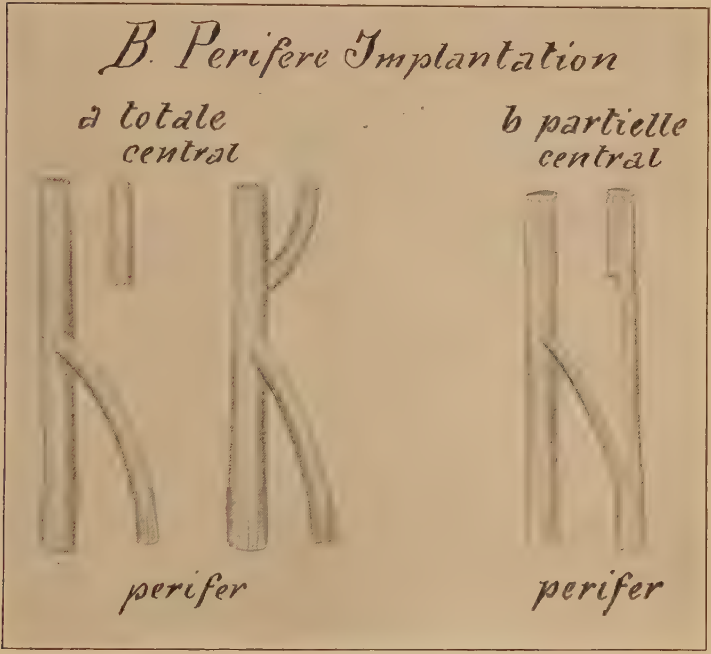


(*b*) or from the paralyzed nerve there is split off as large a piece as possible, which has a peripheral basis and is implanted in the same manner in a longitudinal slit of the intact nerve.

If the paralyzed nerve does not possess any intact sensitive fibres, the whole (function-requiring) nerve may be used, and the central stub eventually be connected laterally to the function-giving nerve-stem (peripheral implantation).

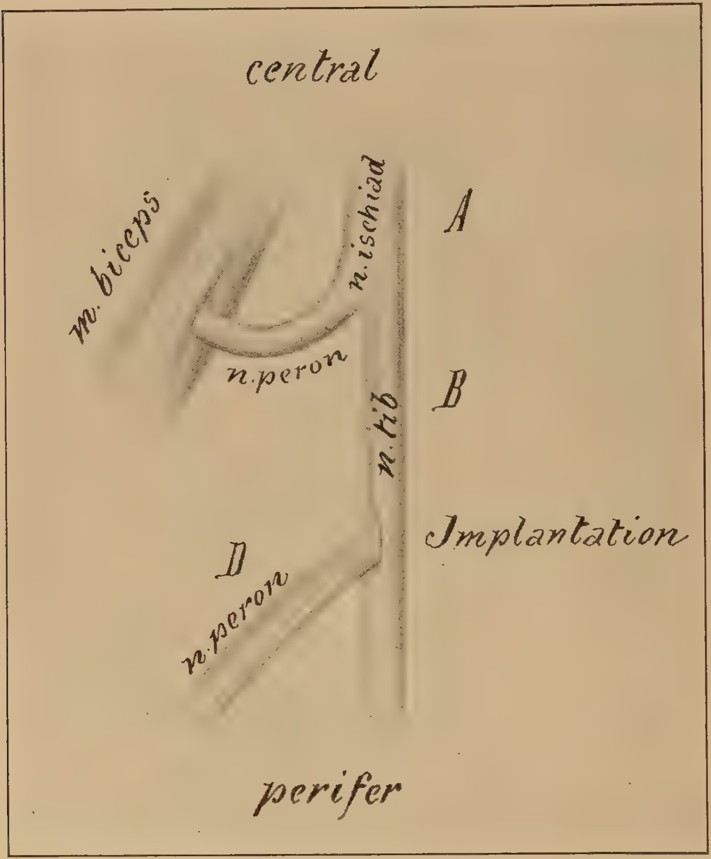
The central implantation is to be recommended, if there is in the vicinity of the important paralyzed nerve an intact nerve of less value, especially a motor-nerve, the cessation of whose function, if the experiment should not be successful, would not be too great a loss; for instance, the neurotization of the n. facialis through the n. accessorius or the n. cruralis through the n. obturatorius.

The peripheral implantation is resorted to, if only large nerves of equal importance are close by, and can be used for establishing a functioning quality: thus, for instance, with plastic operation in the region of the nerves of the arm, n. med. ulnar, rad., n. tib. and peron.



It would be dangerous to split off a central part from the medianus for neurotizing the n. radialis. If the attempt should fail, the paralyzed region would be considerably increased.

This precaution is to be recommended, as the comparison of the results of the operations on man only show about 50 per cent. of cures or improvements. Though I am convinced that many of the failures have to be attributed to the deficient knowledge of neurobiology and the uncertain techniques, for the present every precaution is required, and no intact material should be hazardously risked.



As to the technique of the implantation itself, only the fixing of the part of the nerve to be implanted in a longitudinal slit of the functioning nerve has given good results. The fixing must be effected by a longitudinal suture, as transverse suture, owing to the extraordinary sensitiveness of the nerve-substance against pressure, would destroy the conducting power, and lead to a typical degeneration. With longitudinal slits in the intact nerve and a longitudinal suture, the damage is, as can be seen from histological preparations, not great: only, when it is technically impossible to have the cut and suture parallel to the fibre, a few fibres are cut transversely, and in the preparation they show symptoms of degeneration. The more perfect the cut and suture are, the smaller is the damage caused.

If the paraneurotic suture touching only the sheaths can be adopted, this is to be preferred: but the main thing is the most careful adaptation, even if, in order to attain it, the suture requires to be made through the nerve-substance itself.

Other authors have endeavored to bring about a growing together and a re-establishment of the function by merely placing the nerve-stubs together, and have also been partly successful. I, however, consider this direct insertion to be safer, and have tried it in many cases.

The indications for nerve-plastic are obvious. They are always to be resorted to, if in case of a paralysis the period of a spontaneous regeneration is passed and when the other therapeutic measures have proved useless, if the interruption of the conductivity cannot be remedied by means of an operation (excision of a scar, primary or secondary suture, neurolysis). These nerve-plastics are to be recommended in any case before an extensive tendon plastic is attempted.

If the necessary precautions are taken and the operator has time to wait till the regeneration is completed, no great harm can be done, but a great deal of good may be done. If the result is negative or imperfect, there is still the plastic operation on tendons to be tried as an effective means of correction.

Which of the implantation-methods is to be used, whether the central or peripheral, depends, of course, on the topography of the paralysis.

In a case of a paralysis of the nerves of the arm, only a partially peripheral neurotization can be thought of, on account of the importance of all the nerve-stems and their quality as exclusively mixed nerves, Owing to the small distance of the nerve-stems on the arm, the technical execution offers no difficulties. On the upper arm, in the bicipital suture all the crossings between the nerves may be carried out, in the bend of the elbow the n. radialis as well as the medianus and ulnaris may be reached. The same of the lower arm.

For a neurotization of the n. facialis the most favorable is the n. accessorius before or after its passage through the sterno-mastoid (*Körte*).

Of greater importance for our specialty are the types of paralysis on the lower extremities.

In a case of a paralysis of the n. peroneus its peripheral total or partial implantation into the n. tibialis on the bend of the knee is technically an easy matter. On account of the sensitive fibres it is advisable either to leave a thin part of the n. peroneus standing or to place the central stub likewise laterally against the tibialis.

In the case of a paralysis of the region of the tibialis the *vice-versa* operation is quite as easy. Through experiments on animals and histological after-examinations it has been proved that the peroneus is sufficient for a neurotization of the n. tibialis. In the whole breadth of the implanted tibialis stub there are by the side of the old scaly degenerated boundaries rich, newly formed axis cylinders, which in the vicinity of the implantation-spot all take the direction of the n. peroneus. It was difficult to examine the sensitive sphere exactly on an animal, especially as the operator is liable to be deceived because of the well-known compensating sensibility at the experiment examinations which it is difficult to avoid.

A still more important chapter for us is the quadriceps paralysis.

I have been successful, on dissecting cadavera as well as in experiments with animals, to neurotize from the nervus obturatorius. As is well known, the adductors are not frequently affected by the paralysis. They occupy, on account of the divided nerve-supply, a special position. They are supplied from the n. obturatorius, which, on leaving the pelvis, divides itself into two branches, one running along the surface and another deeper. The deeper one supplies the hip joint, the obturator externus and the adductor magnus.

The superficial one supplies the other adductors, the pectineus and gracilis, and the skin of the median region of the thigh.

It is this superficial branch which I use for the implantation, for the adduction there still suffices the adductor magnus supplied from the deep branch.

The operation is as follows:—

Through a cut along the arteria femoralis 3–4 cm. downward from Poupart's ligament the vascular sheath is laid bare. A little laterally from the same the fascia is split. A few of the cross-veins going to the vena saphena coming under the knife, the arter. and ven. circumflex, ilium superficial, must be tied immediately after leaving the main vessels. Immediately below there lies in the sheath of the muscle the n. ileopsoas and the n. cruralis, already split up in several branches. It is laid bare as much as possible on top. A second cut goes 4–5 cm. from the pecten, pubis downwards, a little medially and parallel to the tendon of the adductor longus, which can easily be felt. Immediately after cutting the skin there appears the white and shining tendon of the above-named muscle. Ligature of the art. and ven. pudenda externa. Below there runs obliquely from the inside to the outside and above to the fovea ovalis the vena saphena magna. At the top the cut comes close to the seminal cord, which eventually is to be held up by a hook. Now the fascia of the adductors is opened, and the same drawn, with the n. pectineus medially and below the n. pectineus lying upon the adductor magnus, when there will be found the ramification of the n. obturatorius.

From the latter there can easily be insulated the long branch leading to the gracilis and the adductor longus. It is cut off close before entering the muscle, its sheath bound with a thread; and now the central stub, after the laying of a tunnel running above or below the bundle of vessels, is drawn through this tunnel through the n. cruralis.

From the latter the branch, generally intact, leading to the m. sartorius, is to be insulated. From the other part of the nerve a slit is made, as near as possible to the top where it is less fibrous, by separating the fibres by means of a needle or a pointed probe; and into this there is fixed by a longitudinal cut the branch of the obturatorius with the cut surface directed peripherally. There is almost no tension, especially with man. With the dog the operation is more complicated on account of the lig. Puparti lying deep under the skin and also on account of the obliquity of the seminal cord.

As to the results, I cannot, on account of the short time, give a final opinion; but I have no doubt that these plastic operations have quite the same chances as all others, and are, at all events, worth a trial, because all other correctional methods are still open to the same. Their chances are in no way lessened by the undertaking of this operation. And the advantage of this method of correction is that it does not interfere with any other methods known and practised, but is an addition and an increase to our therapeutical resources.

As the plastic operation of the tendons has risen to such a dominating height from small beginnings, at first received with incredulous doubt, I hope that this gain will also grow and flourish; and if you, gentlemen, assist me with your co-operation and examination, I feel convinced that we shall victoriously overcome all the obstacles of this far more subtle and difficult matter.

The literature on this subject is to be found in a paper by the same author in the *Zeitschrift f. orth. Chir.*, Bd. XIII. Heft 2.

III.

REPORT OF A CASE OF NERVE ANASTOMOSIS FOR THE CURE OF INFANTILE PALSY.

JAMES K. YOUNG, M.D., PHILADELPHIA.

The reports of successful nerve anastomoses for the treatment of facial paralysis* led me, at the suggestion of Dr. William G. Spiller, to attempt a similar operation for the cure of infantile spinal paralysis. A suitable case being selected, I undertook the operation on Dec. 4, 1902, which is here narrated:—

M. W., aged five years, was admitted to the Polyclinic Hospital Dec. 2, 1902. The father and mother were living and well. One sister was living, six years of age. The patient had suffered from bronchitis since she was six months old, had had measles when ten months old, and had had scarlet fever one year previous to her admission to the hospital. Her health otherwise was normal. Her birth was normal. She was nursed at the breast for twelve months, since which time she has had ordinary table food.

The history at the time of admission was as follows: The affliction began three years ago with a slight fever, which lasted for a few hours. She then went to sleep; and, when she awoke, it was found that she was paralyzed in the right leg. The paralysis was present both as regards motion and sensation. She was treated at the Orthopedic Hospital for four months, and was discharged improved, but unable to walk. She began to walk about one month after her return home, and has been walking ever since, although the character of the gait has not changed. She walked with the right foot slightly everted, and dragged the foot. In the sitting position the foot was slightly everted and extended upon the leg, and could not be

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* Dr. Harvey Cushing, *Journal of Nervous and Mental Diseases*, 1903, p. 367.

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inverted and flexed upon the leg by voluntary movement. The first attack of the disease was not associated with pain, vomiting, night sweats, nor cough. She has been wearing a brace for two years. There has been no loss in weight.

Operation.—On Dec. 4, 1902, under ether anæsthesia and with aseptic precautions, an incision three inches in length was made downward from the head of the fibula of the right leg. The fascia was divided upon a groove director. The peroneal nerve was exposed, and secured with a loose catgut ligature. The fibres of the peroneus longus muscle were then separated, exposing the distribution of this nerve. This was found to be the same as in the cadaver upon which the dissection was made, the anterior tibial muscle being supplied by three small nerves before the division of the peroneal nerve into the anterior tibial and musculo-cutaneous occurred. The proximal extremity of the nerve supplying the anterior tibial muscle was divided; and, a slit having been made in the musculo-cutaneous nerve, the cut extremities were inserted into this, and secured with fine formacized catgut. The paralysis being to the tibialis anticus muscle, Dr. Spiller, who was present, suggested that an anastomosis be made with the musculo-cutaneous in preference to the anterior tibial, because the anterior tibial muscle is frequently supplied from the anterior tibial nerve, and he thought that the musculo-cutaneous would be a healthier nerve. The fascia and wound were closed with interrupted catgut sutures, and aseptic dressings were applied, and the entire leg secured in a plaster cast from the toes to the hip.

The cast was removed December 7, and the wound found to be dry and in excellent condition. On December 10 the patient was discharged, still wearing the cast, with directions to wear it for another week. On December 17 the cast was removed, and there was found to be a slight return of power in the anterior tibial muscle.

On June 1, 1904, the patient was examined by Dr. Spiller and all the muscles of the anterior tibial region gave a good response to a slowly interrupted faradic current. The response of the anterior tibial, while fainter than the others, could be detected by the hand.

Technique.—The most important factors of the operation are anatomical exactness and precision in the identification of the nerves. The importance of making a dissection before operating on cases of this nature cannot be overestimated; and, in performing the operation reported, the dissection was examined carefully several times, in order to insure great precision in the operation. The anterior route was suggested; but the lateral route was chosen by the operator on account of its anatomical advantages. Selecting the head of the fibula as an important landmark, the peroneal nerve was at once reached, and its distribution exposed. It is important in all nerve operations to expose and manipulate the nerve as little as possible.

The anastomosis of the nerves themselves may be accomplished in several ways. The separation of the sheath is possible in large nerves, but the difficulty of securing the sheath of the anastomosed nerve to the sound nerve must be considered. The ideal method of anastomosing nerves would be to place the axis cylinder of the divided nerve in relation to and parallel with the axis of the sound nerve.

In the operation described the instruments used were eye instruments, the fixation forceps and the Graefe cataract knife being employed. In these operations, rapidity of execution is very important, in order that the nerves may not be exposed to accidental injury during the course of the operation.

Selection of Cases.—There are two factors to be considered in the selection of suitable cases of infantile spinal palsy for this operation, the time which has elapsed since the occurrence of the palsy and the reactions of the muscles to the electrical currents. It is not definitely known when the nerves and muscles degenerate in this affection; but a suitable time for the operation would appear to be between six months and three years, although experience may extend the time of operation to a later period. Cases of infantile paralysis differ so greatly in the rapidity and amount of regression that the length of time seems of less importance than the condition of the muscles. It is obvious that, if the reactions of degeneration are present, an operation of this character would be useless.

Possibilities of the Operation.—The future of this operation can be only speculated upon, and the careful selection of suitable cases is the most important element of success. Each case of infantile spinal palsy is a study in itself, and the anastomoses of nerves should be accomplished in such a manner as to injure as little as possible the other parts. In many cases the extent of the paralysis will preclude the possibility of nerve anastomosis. In other cases the anastomosis of the part may be supplemented by tendon grafting, and in some instances the nerve anastomosis will be found preferable to tendon grafting.

I regret that in the interval since performing the reported operation I have not been able to present other cases, but among the many cases presented to me for examination only a few have shown any chance of improvement. In one of these the conditions were exactly similar to the one performed; and the time, six months after the attack, offered a more favorable prognosis. The patient was admitted to the hospital, but the father refused the operation. In another case the paralysis of the extensors of the leg offered a chance of improvement by attaching the muscular branches of the popliteal and the short saphenous to the peroneal. This has been proposed, and the operation is under consideration.

The attachment of the external popliteal to the internal popliteal offers some prospects of improvement in paralysis of the peroneal nerve, but there is liable to be a loss of sensation on the outer side of the leg. The intentional division of the peroneal nerve and its union in a different position, rotating the nerve upon its axis, has been suggested and performed.

At the present time we can but surmise as to the possibilities of nerve anastomosis, but from the results already obtained we cannot but feel that the future probably has in store for us many surprises which may lead to gratifying results in the treatment of infantile spinal paralysis.

The reported case has been previously shown at the meeting of the Philadelphia Neurological Society, Feb. 24, 1903, by Dr. William G. Spiller, and subsequently reported by him.*

DISCUSSION.

Dr. Albert Hoffa, of Berlin, said that he had not tried the method; but in view of the experience of Dr. Young it seemed likely that we shall come to make nerve transplantations in some cases of spinal paralysis, but that it would take a long time to get final results, since the regeneration of nerves takes from six months to one year. If we are to obtain results in a shorter time, the technique must be perfected; and, if the operation fails, we still have the operation of tendon grafting to try in these cases. In suitable cases he expects to make use of the operation.

Dr. De Forest Willard, of Philadelphia, said that it seemed to him that neuroplasty was worthy of consideration, and that it had a place on our list of surgical procedures. At least, after no advancement has taken place in such a case, which we may expect in many cases, then comes the time for nerve transplantation and nerve implantation. Later on in the case would come tendon grafting. Ten or fifteen years ago he made some experiments in dogs with nerve section and implantation and also in traumatic lesions, by which he found that the taking of a half of a nerve and carrying it into an opening in another nerve still leaves perfectly satisfactory motion in the nerve distribution from which we bear the half, quarter, or third of a section. Microscopically, he found that in the callus thrown out between the ends of the nerves he had a gradual working in of nerve fibres, so that there was no direct communication, but a perfect working transference of nerve power, and he was able to get good muscle action below that point. Another interesting point in this subject is the vicarious action of nerves,—a collateral circulation, so to speak. Three months ago he saw a case operated upon ten years ago. This was a case of traumatic injury which tore out everything in the fore arm, leaving a jagged, lacerated wound. All tendons and nerves were sutured together as far as possible. The median nerve was found to be torn for a distance of eight inches, so that it was entirely lacking. There was total loss of power in the region and for a long time after. At the present time he has almost perfect motion in every finger, and perfect sensation except for an area of about a square inch in the palm of the hand. He can use this hand almost as well as the other.

* *Journal of Nervous and Mental Diseases*, June, 1903, p. 369.

Dr. Frank E. Peckham, of Providence, said that he had done two operations on nerves similar to the one described. In both there was paralysis of the peroneal group. One case followed injury to the spine. Branches from the internal popliteal nerve were inserted into the external popliteal nerve. Improvement was noticed two or three months after operation. After one year the improvement was still more marked. Another case was that of an adult in whom infantile spinal paralysis had occurred in childhood. Exactly the same operation was done, with decided ability to use the peroneal group of muscles after two or three months.

Dr. Harry M. Sherman, of San Francisco, thought that the limitations of the operation were very great, if we could not operate when reactions of degeneration were present. He did not understand how it was possible to get proper co-ordination when the peripheral anatomy was so disturbed.

Dr. Young said that, if the reactions of degeneration were present, he would not recommend the operation. He regarded the reactions of degeneration as an indication that the muscles have undergone fatty degeneration. If the muscles have undergone such change, it is useless to attach the nerves, to get power back in them. The muscles are changed greatly in these cases, as shown by the color. Some are light pink in color, while others are dark pink. If there is partial degeneration, the muscles will be a light pink, and so on down to yellow. It would be useless to attach muscles which are fatty. If reactions of degeneration are present, he would not undertake the operation. However, the reactions of degeneration as given by the neurologists are uncertain, since they are not quite certain what they are getting in the muscles. The surgeons will have to add to their knowledge.

Dr. Spitzy, of Graz (by invitation), said that he did not agree with Dr. Young. We know by the latest investigations that muscles which seem quite degenerated, if shortened or again connected with the centre, will cause regeneration to take place. Some muscles, especially the facial, will give no reaction after being paralyzed for eight years, and yet, when again connected with the centrum, regeneration takes place. Recent researches in Germany give a new aspect to some of these questions. The seat of co-ordination is in the brain. When a peripheral nerve is paralyzed, it is possible that another centre may take on the function of the paralyzed one. There are many ways for impulses to come from the different centres. It may be possible that the centres may be re-educated. There are two theories of nerve regeneration. When an intact nerve is passed into a paralyzed one, the axis cylinders of the healthy nerve grow peripherally into the degenerated nerve. When the connection with the centre is re-established, the muscles regenerate, and are again able to do work, since their degeneration was secondary to that of the nerve. The second theory is that, when connection is made between a healthy nerve and a degenerated one, regeneration takes place in the unhealthy nerve from the sheath of Schwann.

IV.

THE
FINAL RESULTS IN TENDON TRANSPLANTATION.

PROFESSOR DR. ALBERT HOFFA, BERLIN.

Tendon-plasty, first conceived and employed by Nicoladoni, has become one of the most important operations in the field of orthopedic surgery. The indications for the operation have become more and more extensive, and it would therefore seem to be of value to examine and discuss the final results.

In order to achieve a good result after a tendon transplantation, four conditions are necessary:—

1. Perfect asepsis.
2. Prevention of hemorrhage.
3. Healthy muscle material.
4. The tendons must be united under certain tension.

I wish only to enter into a discussion of the last two points.

Notwithstanding the frequency of anterior poliomyelitis, there are very few works on the pathology of the paralyzed muscles. It is the general supposition that the paralysis produces an atrophy of the muscles,—a diminution in the volume of the muscle fibres.

My assistant, Dr. Koch, has supplied this deficiency of exact pathological knowledge in an excellent article which will shortly appear in the *Zeitschrift für orthopaedische Chirurgie.* He has histologically examined the paralyzed muscle, and found that in anterior poliomyelitis it undergoes a more or less fatty degeneration; that, furthermore, these fatty deposits occur either in continuity or at intervals. It is very noteworthy that accompanying this fatty degeneration there is always a regeneration taking place.

Upon this fact rests the recovery of the paralyzed muscle. It is well known that in anterior poliomyelitis a part of the

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muscle function in time returns, and only certain muscle groups remain palsied. This, again, can only be explained by said power of regeneration of the muscle. The paralyzed muscles are variously colored, sometimes rosy red, sometimes yellowish-white. These and all intermediate shades can be observed in one muscle alone according to the varied quality of fatty degeneration in its different stages.

We can transplant with success only such muscles as possess some power of regeneration. Nevertheless, should we find at the time of operation that a muscle has a yellowish color, this need not prevent us from using the method; for we cannot decide *a priori* whether or not it possess the vitality desired. Of course, one examines macroscopically, and as far as possible uses only the rosy-colored muscles for transplantation.

It is also of the greatest importance—in fact, an essential condition—that the muscle which one wishes to transplant is united to the other tendon under sufficient tension. We know that every muscle possesses a certain amount of elasticity and tone, and that these are both lost in anterior poliomyelitis. There still remains, as already stated, the power of regeneration; but this alone does not suffice to bring back muscle function. We must therefore, by means of the operation, restore as far as possible the elasticity and tone; and we can attain such result only through shortening the muscle itself. I repeat that this shortening of the muscles is the essential factor leading to good results.

In observing the results as a whole, we cannot expect very much from an operation on a limb totally paralyzed. We cannot in these cases make the leg functionate again, but must be content in freeing these unfortunate patients from depending upon orthopedic apparatus; and this we succeed in doing in a great number of cases.

In other cases by means of the operation we produce a certain amount of tendinous fixation of the joints, while still allowing a certain amount of functional activity. By accomplishing this, we make the patient independent of the use of braces, with which he would otherwise have to worry along.

Lastly, in some cases we attain the ideal result by bringing the muscle back to life. These are the ones in which the regenerative powers are still present in the muscles. By shortening the muscles, we restore their normal elasticity and tone.

With reference to the mode of operation employed we speak of

The Old Operation,—the operation of Nicoladoni;

The New Operation,—the operative method of Lange, which is a periosteal transplantation.

It is my opinion that one operation does not exclude the other, but that they should be used in conjunction with each other. In most cases the best result is to be obtained by combining the two methods; as, for example, in a case of paralytic flat foot, we take a part of the tendo Achillis, and by Nicoladoni's plan attach it to the lower end of the paralyzed tibialis anticus, while we take the peroneus brevis, detach it from its insertion on the fifth metatarsal bone, take it behind the tendo Achillis, carry it to the inner side of the foot, and here attach it to the periosteum of the scaphoid bone.

To get good results, one must have had considerable experience, which one gets by doing a great many such operations. In every case, before doing the operation it is necessary to formulate an exact plan to be carried out. In most cases it is necessary to do a combined operation, lengthening the muscles on one side, shortening them on the other, and sewing together the healthy muscles and the paralyzed ones, and, as I have already said, making a new insertion of some of the tendons in the periosteum.

My own experience has shown me that the most important essential for the success of the operation is to obtain the highest possible tension with an over-correction of the deformity. To obtain this result, it is absolutely indispensable to correct the deformity before the operation. In a case of paralytic clubfoot of anyway marked degree, for example, we must first correct the deformity at least a fortnight before the operation of tendon grafting. During this time the foot in the corrected position is put in a plaster-of-Paris cast. After this has been done, it is then possible to obtain the required degree of tension of the tendon.

Much of the success of tendon-grafting operations depends upon the after-treatment. After such an operation the limb is to be placed in a plaster-of-Paris cast, and immobility secured for a period of six weeks. After the cast has been removed, I usually place the limb in splints made especially for this purpose, which retain the limb in the desired position for a considerable period of time (oftentimes for six months). These splints are so applied that they can be easily removed, and massage, electricity, gymnastic exercises, and baths readily made use of. The longer and more careful the after-treatment, the better are the final results.

I am indeed very sorry that I am unable to show you some of the cases that have been operated upon by this method. I had the pleasure of showing about fifty such cases last April upon which I have operated to our German Surgical Society. Our German surgical colleagues are, of course, very sceptical, but were very much astonished at the good results obtained in these cases.

I shall not detain you but a moment longer. I only wish to add that I have done some original work in tendon grafting, and have transplanted the trapezius to the position of a paralyzed deltoid in cases of shoulder-joint paralysis. In cases of spastic contracture of the fore arm and elbow I have obtained rather good results in overcoming the pronation of the fore arm by transplanting the pronator teres muscle from its attachment to the internal condyle of the humerus to that of the external condyle, in order that this muscle may act as a supinator muscle.

Finally, I can recommend as a very good operation for paralytic talipes calcaneus an oblique osteotomy of the calcaneus, so as to bring the tuber calcanei upward, and thus obtain a real shortening of the tendon.

V.

SURGICAL PROCEDURES FOR THE RELIEF OF INFANTILE PARALYSIS OF THE LOWER LEG.

JOHN DANE, M.D., AND DAVID TOWNSEND, M.D., OF BOSTON.

Although the various surgical operations for the improvement of the conditions found in the lower limb as a result of infantile paralysis have been many times described and excellent results reported for every one of them, it seemed to the writers that a comparative study of such results might be of some interest, and perhaps of assistance, in determining the question of what operations offered the best prospect of a useful limb for the cases that are constantly seeking surgical help at our hospitals. Such an investigation was made possible through the kindness of the Orthopedic Department of the Children's Hospital in Boston, and the results are summarized in brief in this report.

Fifty consecutive cases were taken from the records of the hospital, that some years previously had undergone the operations of tendon transplantation, arthrodesis, and astragalectomy, and an attempt made to find the present condition of the limbs as regarded their usefulness for support and locomotion. Unfortunately, many of the records made before operation were not as full and accurate as could be wished; but a general idea of the condition of the foot has been made from them for the table here given. As the operations were performed by various surgeons, the equation of personal technique was practically eliminated. In considering the results, it is important to remember that the after-care was purely the venture of the two out-patient clinics. That such care is far from the best possible for cases of tendon transplantation or grafting will readily be admitted; but the question that we were trying to study was not what improvement can be obtained under the strict personal care of a surgeon who has complete control

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of his patient, aided by really intelligent co-operation of nurses or parents, for a period covering many months or even years, but what can be expected under the conditions that must almost necessarily confront both surgeon and patient in the course of prolonged treatment in any of our larger hospitals.

Of these fifty cases we were unable to ascertain the present condition of fourteen. The data concerning the forty operations performed upon the thirty-six remaining cases have been condensed in the following table:—

Sex.	Age.	Previous Condition.	Operation and Date.	Present Condition.
Boy	10 y.	*Right* thigh abducted and flexed. Flexion to right leg not maintained. Feeble adduction. Attempted extension = rigid hamstring tendons. Foot everted in dorsal flexion. *Left* foot = slight limitation in dorsal flexion and slight rigidity tendo Achillis. *Calcaneo-valgus.*	Peroneus longus and brevis into tendo Achillis. (September, 1896.)	Foot abducted 45° at ankle joint, pronated, and everted. Little power of flexion and extension. No adduction, little abduction. Ant. tibial gone. *No benefit.*
Boy	8 y.	*Equinus.* Equinus right foot. Anterior muscles weak. Tendo Achillis tense. Plantar fascia contracted. Slight atrophy thigh.	Peroneus tertius into tibialis anticus. (June, 1897.)	Right foot = pes cavus. Plantar flexion good. Extension limited at right angle by tendo Achillis. Walks well, but hardly touches heel. *Cavus* and *equinus.* Little benefit.
Boy	9 y.	Good power in extensor of great toe, common extensor, and peronei. No power in ant. tibial, post. tibial, long flexor great toe, and common flexor. *Calcaneo-valgus.*	Peroneus tertius into tibialis anticus. Peroneus longus into tibialis posticus. (April, 1898.)	No power of extension. Slight pronation at ankle, and walks with toe-drop. *Poor foot, little benefit.*
Boy	8 y.	*Equino-varus.* Contracted plantar fascia. No power to raise outside of foot. Extension of great toe good.	Extensor hallucis tendon split for 1¼ inch, external portion divided at lower end and passed through slit in first two tendons of common extensor and sutured. Tenotomy tendo Achillis and partial division of plantar fascia. (June, 1898.)	Walks on anterior foot. Considerable cavus. Good power in eversion, inversion, and plantar flexion. Great toe not weakened. 3d and 4th toes extend stronger. *Little benefit.*
Boy	10 y.	Equino-valgus. (Slight.)	Extensor com. digit., extensor long. hall., SHORTENED. Flexor longus hall. into tibialis anticus. (June, 1898.)	Foot at rest = considerable plantar flexion, inverted and rotated inward. Can rotate outward, slightly extend, evert to normal, and flex to 100°. *Great toe in position of dorsal flexion.* *Little benefit.*

SEX.	AGE.	PREVIOUS CONDITION.	OPERATION AND DATE.	PRESENT CONDITION.
Boy	12 y.	Peronei good strength, other muscles have very little power. *Calcaneo-valgus.*	Peroneus longus to tibialis posticus. Peroneus brevis to tendo Achillis. (November, 1898.)	*By letter.* Poor, wears brace.
Boy	4 y.	*Calcaneo-valgus.*	1. Peroneals to tendo Achillis. (December, 1898.) 2. Peroneals and tendo Achillis sutured together, shortening Achillis. (March, 1901.) 3. Astragalectomy. (August, 1902.)	*After 1.* Calcaneus, brace. *After 2.* Better, still brace. *After 3.* No apparatus. Extension strong and normal. Slight power in flexion. No valgus or varus.
Boy	18 m.	Tendo Achillis contracted. Tibialis anticus, extensor long. hall., powerless. *Equino-valgus.*	Peroneus tertius and two outer extensors into tibialis anticus. Tenotomy tendo Achillis. (January, 1899.)	*By letter.* Crutches and shoe.
Boy	6 y.	Shortened tendo Achillis. Foot falls into position equino-varus. Tibialis anticus, tibialis posticus, peronei, powerless. Equino-varus.	Extensor hallucis, extensor communis, and tibialis anticus all shortened ½ inch. Tenotomy tendo Achillis. (January, 1899.)	No power. 15° adduction. Walks on outer border of foot. *Club-foot c. shoe.*
Boy	6 y.	Peronei strong, no power to invert foot. Foot everted and pronated. Some power in tibialis anticus on flexing foot. Calcaneo-valgus.	Peroneus brevis and peroneus longus to tendo Achillis. (May, 1899.)	(*1901.*) *Plates*, marked valgus. Fairly strong flexion and extension.
Boy	3 y.	Contracted tendo Achillis. Plantar fascia tense. Dorsal flexion almost absent, what little there is is done by extensors of toes. *Equino-varus.*	1. Tenotomy tendo Achillis and plantar fascia. (May, 1899.) 2. Arthrodesis. (December, 1900.)	A little power in flexion. Slight pronation on standing. Valgus plate. *Full motion in joint: poor.*
Girl	5 y.	Right foot. Dorsal flexors weak except long flexor of great toe. *Equinus.*	Tibialis anticus and extensor longus hallucis sewed together. (August, 1899.)	Foot in equinus. Stands squarely and with slight cavus. Cannot hold foot extended. Voluntary extension limited to extension of great toe. Great toe stands up straight. *No improvement.*
Girl	4 y.	No power in muscles of lower leg, which have attachments on inner side of foot. Peroneals and extensors of toes have some power. *Calcaneo-valgus.*	Peroneus longus to tibialis posticus. Two inner slips of extensor communis digit. to tibialis anticus. (June, 1900.)	No power in flexion. Can extend dorsally to full angle and some strength. *Club-foot shoe. Pronates.*
Girl	5 y., 3 m.	Foot drawn up in position of Valgus, voluntary flexion right leg limited. All muscles seem to act except tibialis anticus. *Equino-valgus.*	Extensor longus hallucis into tibialis anticus. Tendo Achillis cut. (July, 1900.)	Foot abducted at ankle 35°. Very little power in flexion. Extends, everts, and abducts fore foot badly. Marked valgus. *No benefit.*

SEX.	AGE.	PREVIOUS CONDITION.	OPERATION AND DATE.	PRESENT CONDITION.
Girl	7 y.	Anterior tibial gone. Valgus on standing. On dorsal flexion, foot is abducted. *Calcaneo-valgus.*	Extensor longus hallucis into tendo Achillis. (August, 1900.)	Foot insecure. Marked abduction and eversion at med. tarsal joint on voluntary motion. Few degrees dorsal flexion passively. Com. extensor, peronei, and tendo Achillis have good power. *Valgus. No benefit.*
Girl	12 y.	*Equino-varus.* Plantar fascia and tendo Achillis contracted, giving cavus. No power in dorsal flexion. Slight power in extensor prop. hall. Tibialis anticus, peronei, and ext. com. digit. powerless. *Flail foot.*	1. *Arthrodesis.* (Medio-tarsal-astragalo-scaphoid joint). (October, 1900.) 2. Peroneus longus divided and inserted into periosteum at base of 2d metatarsal. (October, 1903.)	*After 1.* Firm ankle joint. Bad adduction and inversion fore foot. *After 2.* Good strong foot.
Boy	8 y., 9 m.	Abductor muscles paralyzed. Great toe flexed, cannot be extended. Foot plantar-flexed and turned in somewhat, with inability to raise outer border. *Equino-varus.*	1. Extensor longus hallucis into peroneus brevis. (January, 1901.) 2. Tibialis anticus into cuboid. (January, 1904.)	*After 1.* Anterior tibial tense on motion. *Varus.* *After 2. Good foot.*
Boy	10 y.	Considerable loss of power in tibials, other muscles have fair power. Valgus on bearing weight. *Calcaneo-valgus.*	Peronei into tendo Achillis. (April, 1901.)	Extension nearly to full arc. No power of voluntary adduction, vol. abduction fair, flexion slight. Some pronation on standing, useful foot without apparatus. *Good foot, but little benefit from operation.*
Girl	8 y.	Contracted tendo Achillis. Great toe flexed dorsally. *Equinus. Valgus.*	Extensor longus hallucis split and inner half into tibialis anticus. Tenotomy tendo Achillis. (May, 1901.)	Extension limited to just beyond right angle. Good flexion. Peronei and common extensor pull foot into valgus (15°). Tibialis anticus and posticus gone. *Walking,* extensors cause eversion and abduction of foot. Stands squarely, useful foot. *No benefit. Transplanted tendon has no power.*
Girl	7 y.	Toe-drop. Extensor long. hall. and long flexors strong, other muscles paralyzed. *Equino-varus.*	Extensor long. hallucis to peroneus brevis. Proximal end flexor long. digit. to tendo Achillis. Distal end of flexor long. digit. united with flex. long. hall. (July, 1901.)	Os calcis ridges sideways 15°, permanent adduction of fore foot at medio-tarsal joint, which can be corrected with difficulty. Very little power in tendo Achillis. Very little power in flexion.
Girl	4 y.	Anterior tibial, posterior calf muscles, and hamstrings weak, no paralysis. *Calcaneo-valgus.*	Peroneus tertius into scaphoid (periosteum). (October, 1901.)	Practically no power of flexion at ankle. Stiff ankle shoe. *No power in transplanted tendon, no benefit.* *Valgus* caused by extensor com. digit.

Sex.	Age.	Previous Condition.	Operation and Date.	Present Condition.
Girl	6 y.	Complete loss of power in muscles of lower leg except:— 1. Flex. long. digit. 2. Tibialis anticus. 3. Peroneus longus. Foot everted in walking. *Calcaneo-valgus.*	Peroneus tertius into scaphoid. (October, 1901.)	Bad valgus on voluntary motion. Toe-drop and throwing motion of foot on walking. Foot extended by common flexor of toes and proprius hallucis. No power in anterior tibial. *Flail foot.* *Equino-valgus.*
Girl	7½ y.	*Valgus.* Marked valgus. Anterior and posterior tibials gone. Other muscles respond feebly. Large amount atrophy of leg.	Peroneus longus through interosseous membrane to scaphoid. (October, 1901.)	Passive flex. and ext. good. Voluntary flex. good. Extension accompanied by 15° valgus. Strong, useful foot.
Boy	6 y.	Inverts and adducts anterior part of foot in walking. Tendo Achillis contracted. *Equino-varus.*	Outer half of tendon of tibialis anticus into peroneus tertius. Tenotomy tendo Achillis. (November, 1901.)	Flexion good, voluntary extension to right angle with foot in proper position. Tendency to cavus with tense tendons in sole. Simple uprights on each side of shoe. *Strong power. Improved.*
Boy	9 y., 9 m.	Peronei and tibials present with good power. Extensor com. digit. present. Extensor proprius hallucis and tendo Achillis paralyzed. *Equino-valgus.*	Astragalectomy. Peronei to tendo Achillis. Arthrodesis (tibia, os calcis, scaphoid). Plantar fasciotomy. (February, 1902.)	Foot in good position. heel projects behind. Firm ankylosis between tibia and os calcis. Medio-tarsal joint movable. Treads squarely. *Excellent foot. Anterior foot well controlled by muscles.*
Girl	8 y., 8 m.	Tendo Achillis contracted, other muscles atrophied. *Equino-varus.*	1. Arthrodesis (tibio-astrag. joint). (June, 1902). 2. Arthrodesis. (August, 1903.)	No power in leg. Useful foot with apparatus. Foot abducted at ankle joint 40°. Fore foot inverted 20°. No equinus. Motion in tib. astrag. joint of 15°, few degrees at calcaneo-cuboid, and considerable anterior to cuboid. Walks on outer border of foot. *Strong joint, some varus.*
Girl	7½ y.	Dorsal flexion quite limited (⅔). Plantar flexion and inversion normal. Eversion limited. *Equino-varus.*	Wedge-shaped piece from os calcis. Part of tibialis anticus to aid peronei (Lange). (July, 1902.) Tenotomy tendo Achillis and fascia in July, 1899.)	Foot can be dorsally flexed to beyond right angle, can be inverted, but not everted. Good power in tendo Achillis, none in peronei. Varus. *Some benefit in extension, still varus.* Silk sloughed.
Boy	5 y.	Tibialis anticus weak, but present, peronei strong. No power in tendo Achillis, does not use fore foot. *Calcaneo-valgus.*	Peroneus longus into periosteum of scaphoid. Peroneus brevis into tendo Achillis. (September, 1902.)	Treads squarely. Good power in extension to beyond normal, slight inflexion. Flexion and extension toes good. Walks with slight tendency to calcaneus. *Good power, useful foot.*

SEX.	AGE.	PREVIOUS CONDITION.	OPERATION AND DATE.	PRESENT CONDITION.
Boy	6 y.	Dorsal flexion possible. No power of inversion. Tibialis anticus, tibialis posticus, powerless. Extensors and flexors of toes and peronei present. Valgus. *Calcaneo-valgus.*	Ext. proprius hallucis into tibialis anticus. Peroneus longus into tibialis posticus, (October, 1902.)	Flexion and extension quite strong. Slight power of adduction, fair power in abduction (without weight). Stands with extreme pronation and tuberosity of scaphoid on ground. Wears brace, can go a few steps without it. With weight extreme valgus. Without weight some valgus.
Boy	7½ y.	No power in quadriceps. *Calcaneo-valgus.* Flail foot. Very little power in any muscles below knee.	Arthrodesis (ankle). (December, 1902.)	Ankle at right angles, and firm. Foot dislocated forward, otherwise in good position. *Firm union, good result.*
Girl	6¼ y.	Slight equinus due to contraction of tendo Achillis. Some power in flexors of toes: all else paralyzed. *Equino-varus.*	Arthrodesis. (February, 1903.)	Slight spring in joint, suggesting fibrous union. Slight inversion of fore foot corrected by raising outer sole. Foot at right angles, very useful foot. *Fibrous union. Good foot.*
Girl	6 y., 8 m.	Foot in position of equino-varus. No power in extensor muscles, tendo Achillis strong. *Equino-varus.*	Arthrodesis. (February, 1903.)	Firm union and excellent position. No motion. Slight inversion, and adduction 10° at mediotarsal joint. Strong, useful foot, walking on outside. Brace. *Firm union, good result.*
Boy	10 y.	Astragalus and scaphoid very prominent. Anterior portion of foot appears as if partially dislocated outwards. Walks on heel. Flexion limited, abduction and adduction much more so. *Calcaneo-valgus.*	Astragalectomy. (February, 1903.)	No pain, no flexion, 20° extension. Useful foot (goes well without apparatus).
Boy	8 y.	Tendo Achillis, tibialis posticus, long flexor of the toes, present: all other muscles paralyzed. *Equinus.*	Arthrodesis (March, 1903.	No power in quadriceps. Firm ankylosis at right angle. Fore foot has arc of motion of 15°. Light brace. Good foot.
Boy	7 y.	*a. Right.* Anterior tibial weak, some toe-drop, some loss of power in peronei. *Equino-valgus.* *b. Left.* Peronei weak, tendo Achillis tense, and marked toe-drop. Calf muscles have good power. *Equino-valgus.*	1. Arthrodesis (*left*) (astrag. scaphoid). ½ tendo Achillis into extensor com. digit. Tenotomy tendo Achillis (*right*). (July, 1903.) 2. Arthrodesis (*right*) (astrag. scaphoid). ½ tendo Achillis into tibialis anticus (*left*). (October, 1903.)	Extension on right foot = valgus. On left motion is straight, but left has not nearly the strength of right. *Walking.* Left foot excellent. Right foot, slight tendency to valgus. Brace on right. None on left.
Boy	8 y., 10 m.	No power in any muscles about foot. *Flail valgus.*	Arthrodesis. (September, 1903.)	Foot in good position. Excellent, firm foot. (High sole and iron upright to sole of shoe.)

These statistics would seem to show:—

1. That in all cases where an attempt was made to restore the balance of muscular power by means of a transference of either the peroneus tertius or the extensor longus hallucis, the transplanted muscle has failed to hypertrophy to an extent sufficient to cause any benefit. (Eleven such cases fail to show any improvement.)

2. That simply shortening the extensor tendons in cases of equinus, even aided by transplantation of the flexor longus hallucis, is of no prominent benefit. (Two operations, both followed by relapse.)

3. That, where the peronei are inserted into a paralyzed tendo Achillis for the relief of calcaneus, the result is usually disappointing. (Five operations, the result in four being distinctly poor, and in one only fair.)

4. That, in cases where the peronei are transplanted to the inner side of the foot for the correction of a valgus deformity, the results are slightly better, but there are relatively few successes. (Six operations. Two results were poor, two fair, and only two good.)

5. That, where a portion of the tendo Achillis is transplanted, to the extensor side of the foot for the relief of equinus, the condition is distinctly improved. (Two operations, that in which the tendon was joined to the common extensor giving a stronger foot when it was united with the anterior tibial.)

6. That the best results following tendon transplantation were in cases where the whole or a portion of the anterior tibial was transferred to the outer border of the foot for the relief of equino-varus. (Three operations, showing two good results and one that was fair. The latter was performed by the so-called Lange method of lengthening the transplanted tendon by means of braided silk. The silk acted as a foreign body, and sloughed, thus preventing a good result. Experience with cases that are too recent as yet to report would seem to show that, where the transplanted tendon can be given a sub-periosteal insertion in the cuboid, the functional result is better

than when it is inserted into the tendon of the peroneus brevis. All the latter cases promising well.)

7. That astragalectomy uniformly yields a good, useful foot. (Three cases, and all successful.)

8. That the results of arthrodesis of the tibio-astragaloid joint are, as a rule, excellent. (Nine operations, with seven good results. In one of these cases complete immobilization was not secured at the first operation, but a second gave a most excellent result. In the other there was no improvement, due probably to a failure to remove a sufficient amount of the articular cartilage. A somewhat stronger foot was found in the cases of arthrodesis than these where astragalectomy had been performed.)

The conclusion would seem to be that, while tendon transplantation may in certain cases yield a satisfactory result, the selection of cases for this operation should be much more careful than it was three or four years ago, and that for the great majority of hospital cases either astragalectomy or arthrodesis offers by far the greatest promise for obtaining a strong, useful foot several years after the operation.

DISCUSSION.

Dr. H. P. H. Galloway, of Toronto, Canada, said that he had performed a considerable number of operations for tendon grafting. For a time he thought that the results were good. An improvement of function had been noticed soon after the dressings had been removed. Two months after in very few cases had there been any permanent gain. He has practically abandoned the operation, returning to the operation of arthrodesis, which he had used before. It has been claimed that the failure of the operation has been due to the failure of the tendons to unite properly. In a case which he had there was a splendid opportunity to prove that this was not the case. The case was that of a child in whom the short peroneus tendon had been detached and transplanted into another tendon. A few days after the operation the child developed diphtheria, and was removed from his care. When he again had an opportunity of examining the child, it was evident that no gain had been derived from the operation. This was attributed to a lack of proper after-treatment. The wound was again opened with the intention of performing arthrodesis. The incision was extended to include the site of the former operation. It was found that there had been perfect union between the tendons. Newer methods have aimed at securing better union of the transplanted tendon because failure to secure the results hoped for were due to stretching or non-union. If the union is satisfactory, but the failure to improve the function is due to failure on the part of the muscle to hypertrophy sufficiently, then improved methods of attaching the tendon will not improve results.

Dr. J. Torrance Rugh, of Philadelphia, reported a case of tendon transplantation after section of the extensor tendons of the toes. The result was a total failure. With regard to the difficulty of maintaining extension of the toes he had found that the extensor brevis was sufficient for this purpose.

Dr. Albert H. Freiberg, of Cincinnati, said that he believed that operations of tendon grafting were not as successful as was expected in some cases because the power furnished by the muscle was used up by the yielding of the tendon. If this is the case, in any case of paralysis sufficient extension and tendinous fixation should be secured. Otherwise the result will be a failure, and tendon operations alone are wrong in principle. In these cases there is only one thing to do; and that is arthrodesis, supplemented with tendon transplantation so done that the tendency of the transplanted muscles will be in a direction to counteract the greatest weakness of the foot. Arthrodesis is the principal thing, and in his experience he has found it sufficient with no adjunct necessary. In transplantation for the cure of paralysis in cases not so extensive as to require arthrodesis he has been able to trace very distinct improvement in the condition. He has used the method of Lange, securing a new insertion for muscles to the periosteum either by direct sewing or by means of prolongation with silk, or inserting it directly into the bone. It seemed to him that in the paper of Dr. Dane a most important consideration has received too little mention,—that of after-treatment. This is very important. It is not rational to expect transplanted muscle to do the work, if the work is suddenly thrown upon it. It will be impossible for the muscle to hypertrophy under these circumstances. It is simply a case of fatigue causing degeneration. The muscle will become weaker than before. We should bring about hypertrophy by gradually bringing about an increase in the function. At first the patient should not be allowed to go about even with a brace. The function must be brought about very gradually, indeed. To this end, massage, electrical stimulation, and the other means at our command should be made use of. He has had better results since observing these points. He believes that the operation of periosteal tendon transplantation is going to stay, and that it is useful, if done properly.

Muscles will stand great tension; and, if this is brought about, the results are very much better.

Dr. A. B. Hosmer, of Chicago, wished to say a word on the subject of tension. From his experience he concludes that failures have been due to a failure to secure sufficient tension. This is particularly true in transposition of the anterior muscles of the leg. If sufficient tension is not obtained, one must expect a poor functional result later on. As to direct bony attachment or that of tendon to tendon, he fails to see any advantage except in cases where periosteal or bony point of attachment is in better line for the action of the live muscle.

Dr. H. Augustus Wilson, of Philadelphia, referring to the statement that the success of the operation depended upon the tension, said that he had learned from experience that tension was a surgical sin. In tendon splicing his experience had been that tension caused irritation and sloughing. Whether the sloughing was due to pulling of the suture material or to tension of the tendons, he was unable to determine. It was noted, however, that, when tension was prevented by fixation appliances, it resulted in speedy union with far better results. He cannot accept the idea that tension is to take place during the four or five weeks after operation. The fixation apparatus that is applied removes the tension during the process of repair; that is, the tendons are not pulling during repair, but are lying in a comfortable, easy position, possibly owing to the flexion of the parts. After the parts are united, it is sufficient to put the parts in a position of tension.

Dr. W. R. Townsend, of New York, said that he was particularly interested in the upper extremity. After some years' study of a number of cases he believes that the results have depended upon the willingness of the individual to keep up certain movements. The after-treatment is the most important part. The mere suturing together is a help; but in a case of drop-wrist, for instance, unless the patient will practise, develop the muscles by massage and passive movements and assist in every possible way, the result will not be satisfactory. This has been demonstrated by two cases which have come under his notice, both having the same condition. In one case daily practice was carried out and instructions carefully followed, while in the other there was an entire lack of co-operation. The sutures held in one case as well as in the other; and yet one case was an absolute failure, while the other was a most gratifying result. The personal equation will largely influence the result. Too much is expected from the mere suturing. The after-treatment must be kept up for not only one year, but for several years, especially where we expect function. Where we work simply for position, that is another thing.

Dr. SPITZY (by invitation) said that in his personal experience with Lange he had found that he used silk sutures. In one case a new tendon was formed for the hamstring tendons. A silk tendon had been made. In three years they were as large as the finger. In one case the tendon was too long, and a portion had been removed and examined microscopically. There was found to be an intertwining of the fibres. In his experience the operation had been found rather satisfactory.

Dr. H. AUGUSTUS WILSON said that the entire absence of a tendon does not prevent the use of a muscle. This fact may have some bearing on the cases in which silk suture material had been used. In a case in which splicing of the tendo Achillis was done for extreme equinus, the tendon sloughed so completely that there was nothing left between the os calcis and the belly of the muscle. Four years later the boy had as complete function of the foot to which no tendo Achillis attached as of the other foot. The place of the tendon had been taken by scar tissue, skin, and underlying tissue. In this case a tendon was not necessary to function of the part. The tendon might be removed in some cases if such a result could be secured.

Dr. R. TUNSTALL TAYLOR, of Baltimore, said that tension is not to be understood as strain, but is used in the sense of over-correction.

Dr. HOFFA said that tendon transplantation is a new operation, and that all have had failures, but that the operation must not be abandoned. Rather we should learn from our failures. Experiments on animals and the results in man have clearly proved that results are to be obtained. If you take a muscle which has no function and attach it to another muscle without tension, results are not to be expected. One must have experience, and the plan of each operation must be carefully mapped out. One must be prepared to use both the method of Lange and Nicoladoni, or the two combined. The result will depend on the healthy muscle material which is available. There must be an over-correction of the deformity before the operation. Tension does not mean strain. Arthrodesis has been satisfactory, but tendon transplantation has given better results in his experience. In a paralytic joint without muscles combine arthrodesis with shortening of the tendon. At first he had a great many failures with the method, and in some cases he has done a secondary operation.

Dr. Dane said that the personeus brevis is important to take on the function of the larger muscles. A prolongation of the tendon by means of silk had not proved satisfactory. Some of these operations which had come under his notice had been done by those who had studied the method under Lange. The after-treatment was well looked after. He considers arthrodesis more satisfactory in hospital work, where it is difficult to obtain proper after-treatment.

Dr. V. P. Gibney, of New York, speaking of tendon transplantation and arthrodesis, said that he felt that a combination of the two was very valuable. Within the last year, in cases of talipes calcaneus, he has exposed the articulation of the os calcis, astragalus, and tibia, making several wedge-shaped osteotomies and getting probably an inch into the centre of the joint, then, bringing up the periosteum so as to get a moderate arthrodesis, the tendo Achillis was shortened and the wound closed. He is not ready to report on these cases yet, but they now seem to show a perfect result. Any amount of dorsal flexion is resisted, and he believes that the position will be maintained.

VI.

THE VALUE OF BIER'S "CONGESTIVE METHOD" IN THE TREATMENT OF JOINT TUBERCULOSIS.

ALBERT H. FREIBERG, M.D., CINCINNATI, OHIO.

It is a number of years since Bier offered his method of treatment by the production of passive congestion to the profession. The plan of treatment seemed at first particularly inviting, since it was based apparently upon perfectly sound reasoning, since its author claimed nothing unreasonable for it. Those who gave it trial had, moreover, the short-lived satisfaction of being encouraged by the immediate effects in a considerable part of the cases in which it was tried,—short lived, however, because it was not long before it became evident that the limit of its usefulness had been reached, or, as was my experience, that it was doing positive harm to some of the patients. The rapid development of abscesses in cases not previously showing this tendency was the chief clinical phenomenon which brought me to this conclusion, and which induced me to abandon, for the time at least, further effort in this direction.

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The appearance of Bier's book on hyperæmia as a therapeutic agent again aroused my interest as well as my admiration for the scientific spirit with which the author persisted in his investigation, persuaded, as he was, of the correctness of the underlying principle, and that the clinical failure was due to faulty application of it, and not to inherent fault. In view of my own experience I was not surprised to find the acknowledgment by Bier that the treatment by passive congestion had done no little harm in his cases as well. This baneful effect was considered by him as due to a too intense application of the method. Instead of continuing to employ a very high degree of venous congestion for many hours daily, he found it sufficient to limit the length of the daily treatment to one hour in most

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Presented at the eighteenth annual meeting of the Association at Atlantic City, N.J., June 8-10, 1904.

cases, and to produce a congestion which is always short of producing pain or other paresthesia.

These considerations apply of course only to joint tuberculosis, the experience in other conditions having brought forward no such dangers as beset its application in these cases.

Added to these facts, has been my conviction that there has been something lacking in our methods of treating joint tuberculosis by local mechanical and general hygienic measures. Already the seat of atrophy resulting from the disease directly, the long periods of functional inactivity which our methods involve, have as a necessary result the absence of that amount of development which is dependent upon the function of the part. On the other hand there is, of course, the experience that a very long-continued fixation and protection of the joint is of primary importance in preventing those recrudescences of the disease which are only too apt to occur in spite of every precaution. In view of these things we should welcome the acquisition of any means which may make it possible to combat the atrophy and by stimulating the local circulation to accelerate the process of repair at the seat of the disease. *A priori* it would seem likely that the congestive treatment would furnish the means for doing these things, and this is in accord with Bier's experience. It is to be greatly regretted that the use of this method is precluded in the treatment of the joints most frequently involved, the hip and spine.

Regarding the technic of the treatment by congestion, Bier has so modified it in his latest publication that all possibility of damage by it would seem to be removed. Originally, the congestion produced was as great as possible: the parts became not only turgid with venous blood, but also cold. Considerable pain had to be endured by the patient, and the constricting bandage was applied for hours at a time.

As at present advocated, the congestion should never pass beyond the "hot stage." That the parts affected should feel distinctly warmer than the normal surface is a *sine qua non*. The patient should feel no pain whatever. The treatment should not be more than one hour daily.

I have found that a bandage of elastic cotton webbing is better than the rubber bandage: the degree of congestion is more easily controlled. In patients of ordinary intelligence the proper application of the bandage is very soon learned, so that it can be applied at home.

With Bier the method of congestion forms the principal part of the treatment, and no stress is laid upon effective immobilization. I have not been able to convince myself of the correctness of this course, and in my cases immobilization and protection have been carried out as heretofore.

The test of any method of treatment in cases of this kind requires a long period of trial, longer than I have thus far been able to give. I can speak of results, therefore, in a provisional way only. My experience, nevertheless, leads me already to hold that we shall have to regard the method as adjuvant to the resources long at our disposal, but by no means destined to supplant them. The improvement in results is indubitable, but not so great that I should be willing to trust to congestion alone. Bier has not failed to encounter cases in which the method was of no benefit, even in his experienced hands.

In speaking of cases, I shall confine myself to mention of a few which seem to me especially instructive:—

Case 1.—Harry C., aet. 19, had been having trouble with his right shoulder for about one year previous to consulting me. Measurement from acromion to olecranon showed a shortening of three-quarter inch. An abscess the size of a peach presented below the humeral head anteriorly. He was suffering great pain, especially at night. The X-ray photograph showed a focus of destruction in the head of the bone and clouding of the joint line. He was at once put upon the congestion treatment, one hour daily. The arm was carried in a sling, but no other immobilization was used in this case. The usual hygienic measures were instituted. Improvement was very soon apparent. Within one week his pain ceased, and has not returned. Three months after beginning the treatment the abscess had entirely disappeared. Tenderness of the joint entirely gone. He has gained in weight. The X-ray shows a decided amelioration of the joint condition. The improvement was, in this case, so marked, so immediately consequent upon the adoption of this treatment, that I cannot resist the feeling that the one depended upon the other. The treatment is still being carried on (five months since beginning).

Case 2.—A girl, nineteen years of age, had been treated for about six months by me for tuberculous disease of the right wrist. The disease had an acute beginning, and had been considered acute articular rheumatism, treatment for which was without effect. I saw her six weeks after the onset, and the X-ray showed a marked involvement of the lower end of the radius and extensive synovial affection. The picture showed marked atrophy of the metacarpals and phalanges. She was absolutely free from gonorrhœa. Treatment consisted at first of immobilization by plaster of Paris and general hygienic measures. This resulted promptly in great improvement, both locally and in her general health. Six months after, however, an examination showed great atrophy of the fore arm, decided tenderness of the lower radial joint and stiffness, although immobilization had been continued during all of this time.

At this time the treatment with the elastic bandage was begun, and it was rapidly followed by a clearing up of these symptoms. Especially noticeable has been the improvement as regards the atrophy, both of bone as seen in the radiograph and in the muscles of the fore arm.

Case 3.—A young woman, twenty years of age, had been suffering with disease of the right wrist for over a year. The joint had been discharging for several months, when it was operated upon by another surgeon. This was about two months before I was consulted. She had been having fever daily. The joint was sufficiently painful to interfere with sleep. The fingers could be moved only to a slight extent and with great pain. The wrist was greatly deformed by a spindle-shaped swelling of the soft parts and also by an enlargement of the lower end of the radius. Three sinuses were discharging, two posteriorly and one on the palmar surface of the joint. She was admitted into the hospital. The sinuses were dressed daily, and the elastic bandage applied above the elbow while the dressings were off. The joint was dressed with an anterior wooden splint. In two weeks a remarkable change had taken place. The swelling of the soft parts had almost disappeared, the joint had become entirely painless, the sinuses had begun to heal. She was now permitted to continue the treatment in her home. The openings closed in a very few days. A very severe attack of influenza was accompanied by a recrudescence, with pain and the reopening of one of the sinuses; but this rapidly subsided after her recovery and the resumption of the congestion treatment. Now, five months after I first saw her, she is not yet well, to be sure. She is improving steadily, however.

To all who saw her this case seemed doomed to amputation, to me particularly so, since my experience with wrist tuberculosis in adults has been most discouraging. I have little doubt, however, of the rôle which this treatment has played in the progress of this case.

I am having similar experiences with other cases in wrist and ankle. I have thus far had no opportunity of applying it in disease of the elbow.

My first experience with this method in disease of the knee was in the case of a mulatto boy nine years of age, in my service at the Cincinnati Hospital. The case had been greatly neglected; and, when I first saw him, he had a flexion deformity of nearly 90°, with a large fungous swelling. The attempt to reduce the deformity by weight and pulley extension had been made without success. Under my direction he was kept in bed without any fixation appliance, and the elastic bandage applied for one hour daily. The effect was at first quite striking. There was within the three weeks following a distinct increase of motion in the joint as well as a very evident diminution of the swelling. Unfortunately, this came to a complete standstill, however; and no further improvement could be observed, notwithstanding great persistence in the treatment. The deformity was then reduced by plaster dressings, and this is to be followed by the usual mechanical method.

In several other cases of tumor albus of the knee which have been under treatment for varying periods by the usual methods, the Thomas brace in particular, I have been making use of the elastic bandage for an hour daily. It has been applied with the patient recumbent and with the brace off. I have in these cases been observing the effect of this plan upon the atrophy, as well as upon the general course of the disease. While I shall not now pause to speak of these cases in detail, I may in a general way state that the atrophy has become perceptibly less in cases which have been for some time under mechanical treatment, as shown by the measurement at the calf. I feel sure, also, that some of these cases have shown a more rapid gain in motion, since this feature was added to the treatment. I have thus far not relied upon the bandage, nor used it at all, in fact, in an acute or sensitive tuberculous knee.

As before remarked, I have not given this plan of treatment a trial sufficiently long to warrant my forming an opinion concerning its *ultimate* value as a curative factor in these cases. I do feel justified, however, in saying that I have seen an undeniable influence upon muscular atrophy, and that it has, in appearance at least, had the effect of accelerating the reparative process.

Bier, in his book ("Hyperaemie als Heilmittel," Leipzig, 1903, p. 189), says that he no longer recognizes a case as indicating amputation when he first sees it. The possibility of cure by congestion is never to be ignored. I do not believe this view to be too optimistic after some of my experiences. It would seem of especial importance, therefore, in disease of the wrist and ankle, where our therapeutic endeavors have hitherto been only too often unsuccessful.

To attain success by means of Bier's method requires, to be sure, no little time and patience, as well as care in details; and unreasonable things should not be expected of it.

From Bier's own report, as well as this short second experience with the method, I feel that its faithful trial in a large number of cases would show that it has a definite value in joint tuberculosis, when it is applicable. I do not believe that our efforts in the direction of our well-tried conservative methods should be abandoned or even relaxed, but that the treatment by congestion should be used as an adjuvant only and for the present at least.

DISCUSSION.

Dr. Spitzy said that in a recent paper of Bier's before the German Orthopedic Association a new apparatus had been recommended. This consists of a glass cylinder, one end being open with a rubber ring. No pressure is made at the opening. A pump is connected with the centre of the cylinder, and by this means an intense congestion is produced.

Dr. Hoffa said that he thought the paper a very important one, and especially to American orthopedists. Bier's treatment has not been employed as much here as abroad. We have had a great deal of experience with this method. It is quite certain that this treatment is of great value in the treatment of joint tuberculosis. We have used it quite extensively in disease of the hip. It should be used only as an adjuvant, and the mechanical treatment should not be abandoned. He is using it in the same way as is Dr. Freiberg. The splint is put on as usual, being removed for one hour per day for the application of Bier's treatment. It is really marvellous how much can be done with this method. The pains quickly disappear, motion returns. He has seen many cases treated by this method alone in which the final results showed a false position. It is not best to trust alone to this method, but to use a combination of methods. In some cases this method is of no use, and may cause the formation of abscesses. In other cases the results are really excellent. Bier himself tells us that we cannot tell beforehand how the method is going to influence an individual case,—in some cases rapid improvement, in others abscess formation. It is always well to try the method, as it does well in some cases.

Dr. H. Augustus Wilson wished to ask Dr. Freiberg whether he considered that there was any analogy between the method of Bier, and the results hereby obtained, and the methods that were quite extensively used some years ago for the application of superheated air. In this method the heat produced excessive perspiration, therefore increased circulation and possibly congestion, and would in some ways seem analogous to the method of Bier. The hot-air apparatus used seventy years ago relied for its efficacy upon pumping out the air as well as the use of superheated air in the treatment of joints. In a number of cases of tubercular arthritis and osteitis distinct material relief was very quickly obtained by the use of the apparatus with a temperature varying from 200° to 400° Fahr. He was inclined to think that it was the effect of the hot air pure and simple. It is possible that the congestion may have had something to do with it.

Dr. Freiberg, in closing, wished to say that he was familiar with the apparatus referred to by Dr. Spitzy. A description of a new method of producing hyperæmia that should be valuable was published recently in a German publication. It consists of a strip which is inflatable by means of a pump. The strip is placed loosely about the arm, and by means of the pump any desired degree of construction can be secured. With regard to false positions obtained after cure by this method, he has had none, because he has believed it possible for nothing else to happen. He can readily understand that this is very likely to follow, even thought the Bier treatment should contribute toward bringing the disease to a termination. He has never used the treatment in tubercular dactylitis alone. In tuberculosis of the wrist and tuberculous dactylitis occurring in the same case the improvement was very rapid. The dactylitis has disappeared as far as can be determined clinically. The disease in the wrist has disappeared almost equally well. Hot air and passive congestion are essentially different both in effects and theoretically. This has been his own experience as well as that of Bier. Hot air produces an active hyperæmia, whereas Bier's treatment produces a passive or venous hyperæmia. The conditions produced are different, and the physiological effect is different. The hot-air treatment is quite valuable, but not in joint tuberculosis. Sometimes the disease has been rendered more acute by its use.

VII.

THE DISTINCTION BETWEEN FRACTURE OF THE NECK OF THE FEMUR AND EPIPHYSEAL DISJUNCTION IN EARLY LIFE WITH REFERENCE TO ITS INFLUENCE UPON PROGNOSIS AND TREATMENT.

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My contention that fracture of the neck of the femur is relatively common in early life is now generally admitted, but there is a strong tendency among German writers to class these cases as epiphyseal separations rather than simple fractures.

Hoffa, for example, in a recent article (*Zeits. f. orth. Chir.*, v. 11, 1903) has collected from literature eighty-four cases, including ten reported by me in 1897. Of these but four are admitted to be true fractures. In other words, he would consider all cases of this type as epiphyseal fractures unless it can be directly demonstrated, as by operation or autopsy, that the injury is not at the epiphyseal junction.

It might seem perhaps that, as both forms of injury are properly classified as fracture, the exact situation is unimportant. In fact, I should not again protest against this classification, however unwarranted it may be by the evidence, were it not that an accurate diagnosis may have a deciding influence on the treatment.

It is well known that epiphyseal disjunctions in other situations are uncommon as compared with fracture in early life, as is well illustrated at the elbow joint. It is difficult to produce an epiphyseal disjunction experimentally, even when the force is adjusted with this end in view. If, then, epiphyseal separation is relatively so common at the hip joint, it can be explained only by anatomical or pathological predisposition. Anatomically there is no predisposition, since the neck is much smaller than the junction. Even when fract-

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ure occurs during the reduction of a congenitally displaced femur, the manipulation which of all others should induce separation, the clinical evidence is in favor of fracture of the neck; and this fracture was demonstrated in the only case that in my knowledge has come to autopsy (Wilson and Rugh, *Am. Jour. Orth. Surgery*, February, 1904).

An epiphyseal junction is not a weak point in the bone during childhood unless as the effect of local or general disease. It is, however, relatively weak in adolescence, as the period of consolidation approaches when the protecting rim of cartilage which covers it has been reduced to an approximately adult thickness. In fact, it will be found on investigation that nearly all the anatomical evidence in favor of epiphyseal separation dates from the two cases reported by Sprengel of patients aged respectively seventeen and eighteen years, and is of similar character; that is to say, an evident predisposition to this particular form of injury was present.

Admitting that either epiphyseal separation or fracture may occur as the result of violence, the following are the chief distinctions between them; and, in introducing the subject, it should be stated that, although complete fracture and, in rare instances, complete separation of the epiphysis may occur, it is far more often incomplete; and it is this class that is under especial consideration.

Fracture of the neck of the femur is usually the result of direct violence. The majority of the patients are healthy children. The disability is immediate. It lessens as repair proceeds, and in a few months the patient may be practically well except for a slight limp and limitation of motion dependent upon the depression of the femoral neck (traumatic coxa vara). Epiphyseal disjunction is usually a more gradual process. The patients are almost always adolescents, very often of the over-weighted or over-grown type. The injury is often slight, of the nature of a twist or strain or misstep,—so slight, in fact, that it may pass unnoticed. The first symptoms are limp, slight stiffness and discomfort, rather than pain referred to the hip and thigh. These symptoms may persist for weeks or months, then, usually after over-exertion or other injury, the disability may suddenly increase,—an indication of a more extensive secondary fracture.

It may be noted, then, that fracture of the neck of the femur in childhood caused directly by violence does not differ essentially in its history or symptoms from impacted fracture in the adult, except that the disability is less and recovery more rapid. On the other hand, the characteristic symptoms of partial epiphyseal separation and the class of patients in which it is most common resemble closely adolescent coxa vara.

There is a well-marked distinction also in the physical signs. In traumatic depression of the neck of the femur there are shortening and outward rotation of the limb with elevation and prominence of the trochanter. Motion may be practically free, except in abduction, which is much restricted, particularly when the limb is flexed.

In partial epiphyseal separation the outward rotation of the limb is more marked; but the shortening is less, usually not more than half an inch. As a rule, the limb is completely extended; and in many instances a resistant swelling is apparent in Scarpa's space. The trochanter is not as prominent, but motion is much more limited than in fracture. In many instances it is almost completely restricted by muscular spasm, and there may be effusion within the joint and sensitiveness to pressure.

The distinctions between the symptoms and physical signs in the two classes of cases may be explained by the situation of the injury and its effect upon the function of the joint. If the neck of the femur is forcibly depressed as the effect of an incomplete fracture at some distance from its articulating extremity, motion, when repair is advanced, will not be restricted other than by the distortion of the neck, thus primarily in abduction, inward rotation, and to some degree in flexion. Corresponding to the depression of the neck there is of course shortening of the limb and an abnormal projection of the trochanter, which may be made more noticeable by flexing and adducting the thigh. If, however, the epiphysis, forming the cartilaginous extremity of the bone, be displaced, as it usually is in these cases, downward and backward, there is direct interference with the movements of the joint, increased by the sympathetic irritation about the injured part. The neck of the femur projects from the shaft at the normal angle. The epiphyseal extremity remains within the acetabulum, and it is the upper and anterior extremity of the neck that forms the projection in Scarpa's space.

In some instances the downward displacement of the epiphysis, which is still firmly adherent to the neck, may not be greater than a quarter of an inch; and, although the characteristic symptoms may be well marked, shortening may be practically absent. Even in these early cases the muscular spasm may be so great that the joint may be practically fixed. The symptoms, in fact, resemble very closely those of disease of the joint, except that the limb is usually completely extended and that pain is absent when the patient is at rest: whereas flexion is the almost invariable attitude of disease, and neuralgic pain is a common symptom. In this class of cases the original injury may have caused simply a rupture of the protecting covering at the epiphyseal junction; and it is possible, in the absence of further injury, for complete recovery to take place. In most instances, however, as the patient continues to use the limb, this displacement is progressive, being accompanied by a process of partial repair. Thus the head of the bone is usually firmly adherent to the neck.

It is apparent that the history and the symptoms which have been described resemble coxa vara far more closely than the ordinary form of fracture. It may be mentioned also in this connection that there are two classes of coxa vara, one in which the entire neck is depressed and the other in which the deformity is in the newly formed bone on the outer side of the epiphyseal cartilage. In this latter class the symptoms may be aggravated by actual fracture at the point of weakness, and in such cases it is practically impossible to distinguish accurately between these and true primary traumatic epiphyseal separation. In fact, it is probable that many of the cases reported as epiphyseal separation are of this type.

In many instances it is possible by means of an X-ray picture to demonstrate the seat of the injury. In ordinary fracture the neck as a whole is depressed, while in epiphyseal separation one can often distinguish the neck projecting at a normal angle from the shaft, the deformity showing clearly at its inner third.

One may conclude, then, that, when fracture at the hip joint follows a fall from a height or other considerable violence, the injury, as in older patients, is usually of the middle or outer portion of the neck. In adolescence, on the other hand, when progressive disability follows slight injury and when the physical signs are similar to those described, one may suspect fracture at the epiphyseal junction.

As has been stated, the importance of an accurate distinction between the two forms of injury may have a direct influence on treatment, assuming that its object is the restoration of normal form rather than palliation of the symptoms. If the neck of the femur has been forcibly depressed and partly broken through, the relation of the head of the bone and the acetabulum are not particularly disturbed. If, then, one has the opportunity to treat such a case before consolidation is completed, one may, by forcibly abducting the thigh and utilizing the upper border of the acetabulum as a fulcrum, actually restore the normal angle. If the limb be fixed for a sufficient time in a plaster bandage at the limit of normal abduction, anatomical and functional cure may be assured. Or, if consolidation is complete, one may, as in simple coxa vara, restore proper elevation of the neck by the removal of a wedge of bone at the base of the trochanter. Both of these procedures have been described by me in papers read before this society. The importance of remedying depression of the neck of the femur, which usually leads to progressive distortion, as contrasted with palliative treatment by support, is sufficiently evident. If, on the other hand, the articulating extremity is actually displaced even to the extent of one-third of its area, the mutual relations of the bones are so disturbed that the function of the joint is seriously impaired. In such cases, as has been stated, the displacement is usually so gradual that it is accompanied by partial repair. It seems hardly probable, therefore, that forcible abduction could have very much effect in directly reducing the displacement. In this class of cases direct operative intervention is the treatment of selection except in those exceptional instances in which the displacement is so slight that it does not interfere materially with function. In cases of this character, support during the period of weakness should assure a cure. This emphasizes the importance of a careful examination in all cases of injury at the hip joint in early life.

Operative treatment in this class should be directed to the exact replacement of the head of the bone, or, in the slighter cases, to the removal of the angle formed by the inner extremity of the neck which interferes directly with flexion. The following cases illustrate the differences between the two forms of injury both as to symptoms and treatment:—

Case 1.—A boy eight years of age was brought to me by his family physician in October, 1901. Three weeks before, he had fallen a distance of fifteen feet, injuring the left hip. A few days later he was able to limp about, but there was no further improvement.

On examination the typical symptoms of fracture were present; namely, the trochanter was elevated and prominent, there was half an inch of actual shortening, and marked limitation of abduction. When the patient was anæsthetized, abduction was found to be limited to one-half the normal range by direct bony impact.

Under traction the limb was slowly and forcibly abducted to the normal limit, the resistance giving way under direct pressure. The limb was fixed by a plaster bandage in the attitude of extreme abduction. In a few days the patient began to walk about; and at the end of four months, when the spica was removed, the X-ray picture showed a restoration of the normal angle. Later examinations have demonstrated the functional and anatomical cure.

Case 2.—A girl six years of age was seen in August, 1902. Three weeks before this time she had fallen from a second-story window; and, as complete disability persisted, she was brought in arms to the Hospital for Ruptured and Crippled.

The physical signs, the treatment, and the final results were practically identical with those of the previous case.

Partial traumatic epiphyseal separation may be illustrated by two cases which will demonstrate the contrast both in symptoms and treatment:—

Case 1.—A girl of fifteen years of age began to limp and to complain of stiffness about the right thigh. No cause could be assigned other than a slight fall, which was not accompanied by immediate symptoms. As the disability became more marked, she was admitted to the Hospital for Ruptured and Crippled eight weeks later, on Nov. 23, 1903. The patient was of the overgrown adolescent type. The disability was almost complete. The limb was completely extended and rotated outward, there was marked muscular spasm and pain on passive motion, the shortening was not greater than a quarter of an inch. Diagnosis of partial epiphyseal separation was made, and the joint was opened by the ordinary antero-lateral incision. The epiphyseal extremity of the femur was found to be displaced downward and backward for about a quarter of an inch, exposing a sharp angular projection of the extremity of the neck. There was congestive synovitis, which accounted for the muscular spasm, and the projecting bone interfered directly with the movements of the joint, particularly in flexion. This projection was removed with a chisel. The wound was closed, and a plaster-of-Paris bandage was applied. This was removed six weeks later, and the patient began to go about on crutches. At the end of three months she was allowed to use the limb, and at the present time there is no disability on walking. Flexion is still limited, but not to a sufficient degree to cause disability.

Case 2.—This patient, a tall boy of fifteen years of age, was dragged for half a block by a street-car. He suffered more or less discomfort about the right hip, but continued at his daily work for two months, when the stiffness and limp had so increased that he was practically disabled. He was admitted to the Hospital for Ruptured and Crippled on Dec. 28, 1903. There was half an inch of shortening, marked outward rotation of the limb, which was practically fixed by muscular spasm in an attitude of complete extension, and a resistant swelling was apparent at the anterior aspect of the joint.

The joint was opened by the antero-lateral incision; and the inner extremity of the neck, which had caused the swelling already mentioned, presented itself. On extreme outward rotation the upper and anterior portion of the cartilaginous extremity which had been displaced downward and inward could be seen, still firmly adherent to the under third of the neck. A thin section of bone was removed from the neck, sufficient to allow a thin chisel to pass between it and the head. With this the epiphysis was completely separated; and, while it was pressed forward, the limb rotated inward until the head was exactly replaced. The wound was closed, and a plaster-of-Paris bandage was applied. At the end of six weeks the boy was allowed to go about on crutches, and soon after the plaster bandage was removed. The limitation of movement that followed the operation gradually lessened, and at the present time there is complete anatomical and functional cure.

These contrasting cases illustrate the importance of exact diagnosis and appropriate treatment, since it is evident that forcible abduction would have been useless in the cases of epiphyseal separation, and that the open operation would have been unnecessary in the cases of fracture of the neck of the femur. The ease with which the head of the femur was replaced in the second case of epiphyseal separation, and the complete cure that followed, indicate that this operation should always be performed, at least in recent cases, rather than excision, which from the functional standpoint must be ultimately disappointing in its results.

It may be noted again that, while it should be easy to distinguish ordinary fractures of the neck of the femur from epiphyseal separation, it may be impossible to differentiate the latter from epiphyseal coxa vara, which is most often seen in adolescence. The essential anatomical difference is this: In epiphyseal separation directly caused by injury there is, it would appear, a sliding downward of the head, including the epiphyseal cartilage, exposing a sharp angle at the inner extremity of the neck. In epiphyseal coxa vara the deformity is in the newly formed bone on the outer side of the cartilage, similar to adolescent knock knee,—a deformity rather rounded than angular. Such deformity, although it may not be caused by injury, may be aggravated by it, even to the extent of actual fracture through the weakened bone. The principles of treatment might be essentially the same as in traumatic cases; but the prognosis would be of course less favorable, and the mechanical treatment must be of much longer duration. It would appear that in any form of coxa vara the line of the epiphyseal cartilage is changed from a direction from without inward to one above downward, thus predisposing to injury at this point.

One may include under fracture of the neck of the femur in early life three classes of cases:—

1. Simple direct fracture of the neck, usually incomplete, occasionally complete.

2. Direct epiphyseal disjunction, usually incomplete, in rare instances complete.

3. An indefinite class in which the deformity is at or in close proximity to the epiphyseal junction. The patients are of a type in which the so-called static deformities of adolescence are common, and it is probable that injury is more often an aggravating than a direct cause of the distortion.

Of classes 1 and 2—that is, of undoubted direct fracture of the neck of the femur—thirty cases have come under my observation. Five of these are classified as epiphyseal disjunctions. Three were males, and two were females. All were adolescents, the youngest thirteen and the eldest sixteen. In three instances the nature of the injury was indefinite, apparently a slight fall. One patient was injured in a game of football, and one was dragged by a street-car.

The twenty-five cases of fracture of the neck of the femur present a decided contrast both as to age and character of the injury. Twenty were children from two to ten years of age. Five were adolescents. Eleven were males, and fourteen were females.

Nature of the Accidents.—One patient fell from a sixth story. Two fell from fourth stories, one from third story, two from second stories. Seven fell from heights of at least fourteen feet. Four fell down flights of stairs. One was run over. One was knocked down by a street-car. One was thrown from a carriage. One fell from a bicycle. One fell from a swing, and in three cases the history was indefinite. These patients were, almost without exception, healthy children. The accidents were severe, and the disability was immediate. In twenty-two of the cases the fracture was incomplete, in three it was complete.

Class 3 has been included under coxa vara, of which I have the records of sixty-three cases, forty-two males and twenty-one females. Of the entire number but twelve were bilateral. Many of the cases were examined before the X-ray was available for diagnosis, but it is estimated that in about one-quarter of the cases the deformity was near the epiphyseal junction; and in a certain indefinite proportion of these it was presumably induced by injury,—epiphyseal fracture. The preponderance of males over females and of unilateral over bilateral cases is certainly significant as indicating the importance of injury in the etiology of coxa vara. If these indefinite cases are to be classified as fracture, it still further emphasizes the importance of injury in causing distortions of the neck of the femur.

The object of this paper is to call attention to two forms of fracture of the neck of the femur, of which an accurate diagnosis may have an important influence upon treatment.

Simple fracture should be treated by fixation at the limit of normal abduction,—an attitude which implies restoration of the depressed neck to its normal position.

Partial epiphyseal separation should be treated, if possible, by direct operative reposition of the head. Excision, which is in such favor with German surgeons, should be an operation of necessity rather than of choice.

Finally, in view of the fact that normal function is dependent upon normal form, one should not be content with mechanical treatment, however efficient it may be in relieving the immediate symptoms, except in those cases in which the deformity is insignificant.

VIII.

OPERATIVE TREATMENT OF INTRACAPSULAR FRACTURE OF THE HIP: A REPORT OF CASES.

CHARLES F. PAINTER, M.D., OF BOSTON.

In making the following report of the results of the operative treatment of three cases of intracapsular fracture, I have four objects in view, namely: first, to emphasize the difficulties in diagnosis in one case, which was one of epiphyseal separation: second, to emphasize the frequency of this lesion, not only among young persons at a time when growth is rapid and bones are soft, but also at later periods of life, when the rapidity of growth and the condition making soft bone are not present so frequently; third, to point out what seems to be a cause, and probably the principal cause, of the failure to unite in these cases, as judged by the findings at operation in two of the patients: and, fourth, to show the good functional results following this operation.

The first case was a young girl who was growing rapidly, but not abnormally so. She had been troubled more or less by what had been called "growing pains" in both hips. She fell on the ice, striking on the right hip. She got up without assistance, and walked to her destination, though with some pain and a limp. She kept about until three weeks later, when she was so uncomfortable that she was brought to the hospital, and entered upon the surgical service. Here hip disease was suspected, and she had a weight and extension applied. She had no pain when quiet in bed, no night cries, no atrophy, and a very slight amount, if any, of shortening. The leg was rotated outward, and any attempt to rotate inward or flex caused pain in the hip.

She had a slight leucorrhœa; and, thinking that the pain in the joint and slight limitation might be due to an infectious arthritis, the hip was examined under ether, after an X-ray

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Presented at the eighteenth annual meeting of the Association at Atlantic City, N.J., June 8-10, 1904.

had been taken which showed no evidences of hip disease, but did show the epiphyseal separation, though it was not recognized. Under ether the surgeon reported that he got normal motions, and only a few adhesions gave way. Tuberculin was given twice to exclude tuberculosis; and, though a constitutional reaction was obtained, no local reaction at the hip joint was detected. The case was then transferred to the orthopedic service, and the operation below described was performed.

It therefore appears that hip disease and separation of the upper femoral epiphysis under certain circumstances may be mistaken the one for the other.

As to the second point, these three cases and several others not here reported, some operated by the open method and others not operated, all point to the conclusion that this form of fracture is not so very uncommon; for these cases have been observed in the past year and a half in one comparatively small clinic. Dr. Whitman has already borne repeated testimony to the frequency of this lesion. Thirdly, in the two fractures here reported, which were cut down upon the obvious reason for the failure to unite, was the presence of fibrous tissue between the fragments, preventing the apposition of raw bony surfaces; and it seemed impossible that this could be displaced by any merely manipulative procedure, and, if not, then no union could be hoped for. In one case the fracture had not been a complete one, and the upper portion of the capsule had fallen into the bony gap, and become adherent there. This was removed, and both edges of the bony cleft refreshed, after which the thigh was forcibly abducted to such a degree as would bring the raw bone surfaces together. In cases seen earlier and properly diagnosed I can readily see that forcible abduction and open incision might displace the infolded capsule, and permit of bony apposition.

Case 1.—April 25, 1903. Mary Donohue, thirteen years. School.

Diagnosis, intracapsular fracture of left hip.

Operation, wiring of head to shaft (fixation in corrected position).

F. H. Negative.

P. H. Negative.

P. I. April 1, 1903, entered surgical service. One month previous slipped and fell, striking on right hip. Since that time walked lame. The lameness, however, was in left hip.

Five days before admission to the hospital, in the evening, felt sudden sharp pain, which has continued since when not lying perfectly quiet. At these times free from pain. On admission, hip could not be moved because of pain. On April 3 ether examination advised by orthopedic Department. On April 6 ether manipulation revealed a few adhesions in left hip, which were broken up. Normal arc of motion approximately obtained under ether.

April 8.—Buck's extension apparatus applied to leg, and maintained a week.

April 16.—Attempt to have child walk showed inability to bear weight on leg. X-ray shows apparent separation of head from neck, left femur, and was transferred from surgical to orthopedic service.

P. E. Fairly nourished and developed girl. Eyes react to light and A. Pulse normal. Heart, lungs, and abdomen negative. No fulness in iliac fossæ. Back flexible. K. K. decreased both sides. No clonus or Babinski. No glandular enlargement. Left leg held in complete extension, slight adduction, and marked outward rotation. Very slight flexion, and no other motion possible on manipulation.

Measurements. A. S. S. to I. M. Right, 79.3; left, 77.9. Umbil. to I. M. Right, 84.7; left, 81.5. Circ. of thigh. Right, 34.5; left, 34.5. Circ. of calf. Right, 23.5; left, 22.4.

Urine examination. Pale color, white sediment, 1002. alk., no sugar, no albumen. Operation. Ether. Dr. Painter.

Incision 12 cm. long over anterior aspect of left hip joint. On separation of soft tissues, no vessels being divided, the capsule was found intact, and without any appearance of disease. It was not markedly thickened. On opening capsule, the head of femur was found in place, but fractured directly across the line of cartilage between the head and neck. Cartilage clear and smooth. Head very vascular. Cotyloid ligament small. The shaft of femur rotated out, and the whole drawn up so that by traction it was impossible to approximate head and neck fragments. Fragment of head approximated closely a portion of the shaft just below greatest prominence of trochanter and on the opposite side.

A silver wire was passed through the upper fragment and this portion of the shaft, and, after being tightly fastened, was buried. Approximation nearly accurate in corrected position. Capsule closed with silk. No ligatures. Skin closed with interrupted silkworm gut. A silk drain of eight strands was passed deep into wound, and two adjacent sutures were left untied. Good recovery from ether.

May 19, 1903.—Condition excellent. Slight post-operative rise of temperature first few days, but no pain or other symptoms. Leg held in complete extension by T splint and posterior wire splint. Forty-eight hours from operation, dressings opened. Sanguineous discharge moderate. Silk drain removed and provisional sutures tied. Damp corrosive dressing. Outer dressing not displaced. Appearance of wound excellent.

May 26, 1903.—Stitches removed May 22. Healing *per primam*. General condition good. No pain or discomfort.

June 2.—Splint replaced on June 1 by a plaster spica reaching to ankle. No tenderness of hip. Apparently a good union. Leg in good position, slight amount of adduction only. General condition of patient excellent.

June 1.—Right leg, A. S. S. to I. M., 77.2. Left, 78.3. Slight outward rotation.

Aug. 28, 1903.—Plaster removed. Union apparently firm. Light plaster spica.

Sept. 21, 1903.—Plaster split. X-ray. Split plaster applied.

Oct. 7, 1903.—Pain all gone, and much improved. To omit flannel spica and continue crutches.

Oct. 14, 1903.—Half-inch high sole. Omit crutches.

Oct. 22, 1903.—Has been without crutches now on and off for a week without pain.

Feb. 1, 1904.—Walks with but little limp and without pain. Considerable outward rotation, but foot can be brought into position. Flexion of about 80°. Abduction limited two-thirds. No evidence of any joint disease.

April, 1904. Practically the same condition is present now.

CASE 2.—Jan. 6, 1903.—J. T., thirty-four years. Printer.

Diagnosis, intracapsular fracture left hip.

Operation, excision of fibrous tissue. Fracture impacted in abduction.

Plaster.

F. H. Negative.

P. H. Scarlet fever as a child. Gonorrhœa sixteen years ago. Health always good.

P. I. Last May, while working at loading heavy bags, first noticed slight pain in left hip. This grew worse, in a few days was unable to work, and used crutches several days, followed by cane. Liniment at B. C. H. Two weeks or thereabouts later, while in Boston, caught cane in crack of a sidewalk, and felt sharp pain in hip. Still kept about. Two days later became intoxicated, and was arrested. Was unable to use leg at all. Does not know if he injured it further at that time. Sentenced to Deer Island. No treatment. In bed six weeks. Had noticed shortening since using crutches. Could not bear weight on leg. Carney O. P. D. on October, 1903. X-ray shows apparent intracapsular fracture of hip. Has remained at home and used crutches ever since. Can limp a few steps, but leg very weak, and weight-bearing very painful. Cannot lie on flat of back for any length of time.

P. E. Patient rather poorly nourished. Pale appearance. Eyes react to L. and A. Pulse regular and of good tension. Heart, lungs, and abdomen negative. No glandular enlargement. K. K. normal. No a., cl., or Bab. Back flexible. Right hip normal. Left hip, trochanter very conspicuous, reaching 5 cm. above Nelaton's line. Flexion to 90°, extension to within 15° of complete. Leg held in slightly adducted position. 20° adduction possible, voluntarily, when lying on back. Pain at limit of arc of motion. Pain always about region of trochanter, extending downwards, but little on outside of leg.

Measurements. A. S. S. to I. M. Right, 83; left, 80. Umbil. to I. M. Right, 87.5; left, 84. Circ. of thigh. Right, 43; left, 39. Circ. of calf. Right, 32.3; left, 30.5.

Urine. 1.7. Amber, clear light plac. sed., 1022. ac., no sugar, no albumen. Urates and phosphates.

Operation. Ether.

Jan. 14, 1903.—T-shaped incision, on the lateral aspect of thigh, the cross-piece 13 cm. long, somewhat diagonal to long axis of leg. The upright incision half that length, extending posteriorly just above trochanter. Neck of femur exposed, old seat of fracture found in neck with callous formation and fibrous union, especially on lateral aspect, where the bony fragments are considerably separated by fibrous tissue, preventing stability and causing a permanent adduction.

Fibrous tissues in line of fractures excised, until mobility at this point was possible, the bony edges curetted to remove all fibrous growth, and the edges brought together throughout and impacted by bringing leg into 25° of abduction. Hemorrhage practically nil; capsule united with catgut interrupted sutures. Skin incision closed tightly with interrupted silkworm gut. Position maintained by plaster spica. Ether well taken.

Jan. 27, 1903.—Dressing of wound through window in spica. Wound healed throughout by first intention. Stitches removed.

Feb. 7, 1903.—Up and about with crutches. No pain or tenderness about hip. Plaster holds well without reinforcement. Foot swollen considerably. Plaster quite tight, and removed to just above knee. To report ten weeks from operation.

Feb. 27, 1903.—O. P. D. record. General condition excellent. No pain or discomfort. Plaster weakening at groin and reinforced.

Feb. 25, 1903.—Spica split. Leg in excellent condition. To wear split cast and report in two weeks.

April 8, 1903.—X-ray.

April 24, 1903.—To wear flannel bandage for two weeks. Three-quarters inch high sole. To have light weight on left foot first.

June 19, 1903.—Motion in flexion permitted to within 10° of right angle. Some permanent outward rotation, inward rotation limited beyond where patella looks forward. Abduction restricted to one-third.

Left leg: length, 81.6 cm.

Right leg: length, 83.5 cm.

From umbilicus: right, 88; left, 86.5.

Case 3.—Feb. 6, 1904. B. H., twenty-seven years. Single. Carpenter.

Diagnosis, intracapsular fracture of left hip. Old and ununited.

Complaint, lameness and pain in left hip.

F. H. Negative.

P. H. No history of any disease or illness. No operative history. Always well and strong.

P. I. In June, 1902, fell from scaffold on his left hip. Taken to Bellevue Hospital, New York, at once. X-ray taken, and was told he had a fracture. Was in bed with extension for two months in hospital. Discharged with symptoms as at present. Then on crutches till nine months ago, when at advice of physician they were discarded and active use practised. Electric treatment (Metropolitan Hospital, New York) for four months. At present using cane and walking with decided limp, and has pain on all motions of the left hip. Pain referred to joint. Always been able to support weight on left leg, but with much pain. General condition good.

P. E. Large, well-developed man. Good color. Pupils equal, and react to L. and A. Tongue clean. Pulse regular, and of good tension and volume. Arteries rather thick. Lies with legs completely extended and parallel, the left abducted and with slight apparent shortening of left hip. Examination of right hip negative, and motions are normal. Left hip: all motions restricted by muscular spasm, with pain in joint at extremes of motion; passive abduction almost 0; about 5° abduction, and about one-half normal rotation; trochanter about 4 cm. above Nelaton's line, with considerable thickening in soft parts above. No swelling, no redness or heat. Motions free in knees, feet, and ankles. Decided palpable and auditory leathery crepitation on motion in left knee (patient says only since present illness). Joints otherwise negative.

Measurements. A. S. S. to I. M. Right, 93.5 cm. Left, 88. Umbil to I. M. Right, 100; left, 99. Trochant. to E. M. Right, 90.5; left, 90.5. Thigh. Right, 49; left, 43. Calf. Right, 35; left, 33.5.

X-ray, C. 196.

Feb. 6, 1904.—Operation under ether.

Incision about 11 cm. long, parallel with shaft of femur, midway between left A. S. S. and trochanter, with centre at line connecting these points. Muscles separated by blunt dissector till, on retracting, the trochanter was exposed. Incision having been placed rather too far outward for good exposure of joint, a second was made, beginning at inner border of first, and extending inward 3 to 4 cm. directly over and parallel with the neck of the femur. Good exposure now showed neck to have been fractured obliquely almost at its junction with the shaft (intracapsular anteriorly, extracapsular posteriorly). Fragments were ununited, surrounded at their opposing borders by a moderate number of osteophytes, and presenting a pseudarthrosis with the articular surface on outer side represented by a bluish eburnated area, size of a nickel placed rather anteriorly and near top. A small amount of redundant capsule was felt interposed between the fragments, and was trimmed away. Osteophytes removed with osteotome and the opposing surface of fragments shaved, the thigh being alternately rotated out and in till, when midway in rotation, with the thigh moderately abducted, they were in almost perfect approximation. The head had previously been found movable in the acetabulum. Fragments were secured in the above position by a tenpenny nail (steel-wire) driven from the outer side of trochanter through the centre of what remained of the neck and into the centre of the femoral head. A single dry gauze drain was inserted to neck, and the capsule in front united below drain by a single catgut suture. A wet $HgCl^2$ sponge was squeezed into wound, and skin closed rather loosely with interrupted silkworm guts, allowing drain to protrude at angle between the two skin incisions which was left unsutured. Hemorrhage comparatively slight. No large vessels divided. No ties required. Dry dressings. Plaster spica from ribs to ankle, leg in complete extension, patella pointing up and thigh in moderate abduction.

Feb. 10, 1904.—Gauze dressing removed in H. this day with escape of about 3 oz. accumulated blood. No fresh hemorrhage. Local and general condition satisfactory. Fresh dry sterile dressing. Spica loose about pelvis, but apparently permitting no motion about hip.

Feb. 17, 1904.—Stitches out, wound clean, healed per primam, except the unsutured area at angle of wounds, which is granulating over and clean. Dry dressing.

Feb. 26, 1904.—Temperature normal since operation. New plaster spica. Care taken not to move hip during change.

March 2, 1904.—New spica fitting and holding well. All conditions excellent.

March 15, 1904.—Condition excellent. No pain.

March 18, 1904.—Complaining of some superficial pain at hip. Window cut in plaster. Unhealed area at angle of skin incisions about 2 cm. in circumference, and bathed with moderate amount of thick brownish fluid of offensive odor, apparent only from the macerated granulating surface. Exub. granulations about margins. Area washed with creolin, and moist creolin dressing applied.

May 1, 1904.—Patient was allowed to go without spica, bearing some weight on the hip, but most of it on the crutches, fourteen weeks after the operation. There was no pain in the hip when weight was borne. The knee was slightly stiff from the prolonged use of a spica. Union seemed firm, and function was apparently returning. Position was good, the shortening being compensated for by the abduction, and the feet could be placed parallel, with the outward rotation corrected.

Post-operative X-ray.

IX.

THE ANATOMIC TREATMENT OF FRACTURE OF THE NECK OF THE FEMUR BY WHICH BONY UNION CAN BE SECURED IN THE LARGE MAJORITY OF CASES.

JAMES E. MOORE, M.D., OF MINNEAPOLIS.

Most old-time surgeons maintained that bony union of an intracapsular fracture never takes place. Sir Astley Cooper never saw but one case of union. Frank Hamilton gave a very grave prognosis, and only admitted the possibility of union in exceptional cases.

Most modern teachers of surgery, and all modern American authors except Senn, offer very little more encouragement. Dennis's "System of Surgery," 1895, says: "As a rule, a person over seventy years of age with a fracture of the neck of thigh will be permanently a cripple, and often bed-ridden. The fracture (intracapsular) generally fails to unite, owing to the non-approximation of the fragments, to the enfeebled condition of the patient, to lack of sufficient arterial supply, and the presence of synovia between the fragments."

Scudder, our most recent author, in his excellent book says, "In case of a fracture of the neck of the thigh bone in an elderly person, treat the patient, and let the fracture be of almost secondary importance." He reports sixteen cases treated in Massachusetts General Hospital, in which there were but two satisfactory results.

In 1883, when Senn was preparing the paper which he read before the American Surgical Association that year, he asked fifty eminent surgeons if they thought bony union could take place. Twenty-seven answered yes, eighteen answered no, and five were in doubt. Half of the American surgeons thought it could not take place. All of the five German surgeons said

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Presented at the eighteenth annual meeting of the Association at Atlantic City, N.J., June 8-10, 1904.

it could. He then clearly demonstrated that most of the reasons given for non-union are not sound, and said, "The only cause for non-union in intracapsular fracture is to be found in our inability to maintain perfect contact and immobilization of the fragments during the time required for bony union to take place." In his "Practical Surgery" he takes the same position, and reports eight cases of bony union treated by his method. He also demonstrated by experiments on animals that bony union will take place when the fragments are properly held in apposition.

It has been frequently demonstrated that the head of the bone has ample circulation. It does unite when properly held. It does not become necrotic, as it surely would if the circulation was destroyed. The head of the humerus is not so well nourished, yet we always expect a fracture of the anatomical neck to unite. Surgeons all know that the bones of old people unite as readily as in younger people, and that most cases of pseudo-arthrosis occur in middle life.

A few surgeons have maintained for a long time that bony union can and will take place in this fracture when it is properly treated. Gurlt, one of the greatest authorities on repair in fracture, said: "There is no specific tendency to non-union in any form of fracture. If the ends of the broken bones can be kept in accurate apposition, union by bone will take place." He specially mentions fracture of the neck of the femur as being no exception to the rule.

A number of German surgeons have taught this same truth. Dr. T. J. Maxwell, of Keokuk, Ia., whose method of treatment I am advocating, and which I will demonstrate, has taught and demonstrated for over thirty years that bony union does take place, and that it will occur in the vast majority of cases, when properly treated. H. O. Thomas, of England, secured bone union in all cases (over forty) by his fixation splint; and later (1892) Ridlon reported twelve cases treated in the same manner with satisfactory results. In 1897 Dr. Newton M. Shaffer reported seven cases treated by means of a long Taylor hip splint, slightly modified. Two of his successful cases are especially worthy of note, because they were cases of delayed union when brought under his care. In 1898 Gillette reported three cases in which bony union was obtained through open operation and nailing the fragments together.

This is evidence enough to convince every right-minded surgeon that bony union can be obtained in these cases, and that the reason that we have so commonly failed is that our treatment has been inefficient. The old stereotyped treatment by moderate extension and long side splint is a failure, and should be abandoned. It is our duty to accept the testimony of these men who have secured good results, and to adopt the most rational of the various methods of treatment advocated by them, and thus remove this "opprobrium of surgery."

Most surgeons agree now that the old classification of fractures of the neck into intracapsular and extracapsular is not a practical one, and that an effort to make a differential diagnosis is liable to do much harm. If the fracture is firmly impacted, proper treatment will not disturb it; and, if it is not, progressive shortening will take place very soon. In the light of recent evidence it is better for us to be content with a diagnosis of fracture of the neck of the femur, and to try to secure bony union in every case. In fact, we shall be violating the confidence reposed in us by our patients if we do not make the attempt by some one of these successful methods.

The operative treatment must necessarily be our last resort in this as in all other fractures which are not compound, but we are very fortunate in having so good a last resource.

The treatment by the long hip splint as recommended by Dr. Shaffer is rational and efficient in the hands of an experienced orthopedist, but the general practitioner and most general surgeons would fail through lack of proper skill in its application. We can all understand how Thomas secured results with his splint. He was a mechanical genius as well as an orthopedist of exceptional skill. Dr. Ridlon has also demonstrated that he can secure better than the average results by means of this same splint. Aside from the fact that this splint does not afford proper facilities for preventing shortening, it is open to the same objection that we offer to Dr. Shaffer's splint. I know from personal experience that the Thomas splint is a clumsy affair, more difficult to apply successfully than any other hip splint, and one that would surely fail in the hands of the average surgeon.

Senn acts upon the theory that, since union takes place when impaction occurs, the nearer we approach impaction, the more likely we are to get union. As you all know, he recommends a plaster-of-Paris splint extending from the foot to the ribs, with direct side pressure by means of a pad and screw. This splint will secure the desired rest, but that the side pressure aids in producing artificial impaction, and that this impaction is desirable, if secured, is extremely doubtful. We do not crowd the fragments toward each other in any other fracture. Why should we in this? The application of a plaster splint to an aged patient, who is often feeble or fat, and sometimes both, is extremely trying and something to be avoided, if possible. Granted that this treatment will secure bony union, we must surely expect shortening.

The principle of extension and counter-extension by means of weight and pulley to overcome muscular contraction has long been accepted as the most rational treatment of fractures; and, if it can be demonstrated that its application is simpler and easier than all others, it is surely the best.

To the *International Archives of Surgery* of 1903 Professor Bardenheuer contributed a valuable article on "Treatment of Fractures by Permanent Extension." The article is profusely illustrated, showing an elaborate system of weights and pulleys for fractures of every description. From nearly 9,900 cases of fracture treated under his direction in twenty-two years there was not a single case of non-union, fracture of the neck of the femur included.

In December, 1903, in Denver, Col., at a meeting of the Western Surgical Association, it was my good fortune to see the specimens of bony union after fracture of the neck of the femur presented by Drs. Maxwell and Ruth, of Keokuk, Ia., and to hear part of a paper read by Dr. Ruth on the "Anatomic

Treatment of Fractures of the Femoral Neck." The specimens and the paper were a revelation to me and a godsend to the patients coming under my care with this fracture since that time. The fact that Dr. Ruth had published papers upon this subject in the *Journal* in 1899, 1901, and 1902, and I had overlooked them, led me to believe that there is room for missionary work in this field, hence this paper. He presented a number of specimens that are beyond question, which convinced me at once that his method of treatment is far superior to any other of which I have knowledge. He reported forty-two cases with 88 per cent. of good serviceable union, excluding four cases in which treatment was abandoned within four weeks, death from intercurrent malady, or in which the injury is too recent to report,—gives good serviceable limbs in 100 per cent. There was no failure to secure serviceable limbs in any case under seventy years of age, and no failure to secure union under eighty years of age.

I will describe the method briefly in my own language:—

The patient is anæsthetized. The thigh is flexed upon the body and lifted up so as to lift the tendon of the psoas and iliacus muscles away from the seat of fracture, as it has a tendency to crowd the soft tissues between the fragments. While keeping up the extension on the limb, it is brought down to the natural position, and a pull of from fifteen to twenty-five pounds applied by means of the usual long side adhesive straps and a pulley at the foot of the bed. Another pull of from ten to fifteen pounds is then applied to the inner side of the upper end of the thigh by weight and pulley. The inner and under side of the thigh are protected by a binder's board or felt splint, so that the pressure will be evenly distributed. This side pull is the special feature of this treatment. It lifts the upper end of the long fragment upward and outward into place, and by making the capsular ligament taut forces the short fragment into position. The short fragment, being attached only by the ligamentum teres at its apex, cannot get out of place so long as the capsule hugs it closely like a coat sleeve. The direction of this pull is upward and outward, so that the resultant of the two pulls is in the long axis of the neck of the femur. The elevation of the side pulley must be such as to overcome the outward rotation. The rotation can be changed at will by raising or lowering the side pulley. I have found a strip of gauze four inches wide and several layers thick a very convenient material of which to make the loop around the thigh, because its elasticity allows it to adjust itself to the inner side of the thigh so as to equalize the pressure. It can be fastened to the bandage which holds the felt splint to the thigh by a few stitches, so as to prevent its rolling up or making pressure on the perineum. The amount of the weights to be applied is governed by the amount required to overcome the deformity in each case. The bed is prepared by placing board slats underneath a hair mattress to prevent sagging. The foot of the bed is elevated eight or ten inches, and the side corresponding to the injured hip is elevated about four inches. An ordinary iron or brass bed will accommodate itself to these elevations, so that the patient's body will act as a counter-extension against both weights.

Since December I have had personal knowledge of three cases. The first case, a patient of Dr. Thomas S. Roberts, was under my care throughout. The patient was a frail woman of seventy-eight years, who fell on an icy pavement and sustained a fracture of the neck of the femur. There was crepitus and shortening of two and one-half inches at the end of three days. The treatment was carried out as previously described, resulting at the end of seven weeks in bony union without shortening. A month later she made no complaint of her hip, but was crippled by her knee, which was limbering up very slowly. By June she was walking about the house. Dr. Ruth advises that the weight be removed every three or four days, and the knee flexed to prevent stiffening. I did this, but, it seems, did not do it thoroughly enough. After the first few days the patient was assisted into a sitting position every day, and after a time she was able to assume that position with little or no help. The weights adjust themselves over the pulleys, so that the fracture is not disturbed by this procedure.

My patient experienced less discomfort than any patient I have ever had with a broken femur. In fact, she experienced very little more discomfort than she would, had she been confined to the bed without a fracture. She usually slept well.

The second case I did not see, but I heard very frequent reports of her condition from my colleague, Dr. J. Clark Stewart, who applied this treatment from my description. The patient was a very fleshy woman, sixty-six years old; and the result was bony union with one-half inch shortening. She was walking about the house at the end of three months.

I saw the third case in consultation in Chicago seven weeks after the accident. The patient was a well-preserved woman of seventy-nine years. I found her at this time very comfortable and in good health, but with one inch shortening. Crepitus was present, showing that union was not taking place. She had a well-adjusted long side splint and a weight of about fifteen pounds at the foot of the bed. The foot weight was increased to about twenty pounds, and a side pull of ten pounds applied. I saw her one week later, when she was very comfortable and both limbs were of the same length. I now believe that the side pull would have overcome the shortening without adding to the foot weight. I saw this patient six weeks after the application of the side pull, and found every evidence of bony union without shortening.

DISCUSSION.

Dr. Hoffa said that we must thank Dr. Whitman for bringing our attention first of all orthopedic surgeons to this fracture of the neck of the femur in children. Since this first article and since the use of the X-ray we find that fracture of the neck of the femur is not so infrequent as we had before thought. We formerly thought that fracture of the neck of the femur occurred only in older persons. He agrees fully with Dr. Whitman that we must recognize a difference between fracture of the neck and epiphyseal fractures. In his experience epiphyseal separation is more frequent. All the X-ray pictures of cases here shown are cases of epiphyseal fractures. He has reported 84 cases, all of which were either diagnosticated by the open operation or the X-ray, and in all these cases we found but 4 cases of real fracture. He has operated now upon 16 or 17 cases. All these cases were brought to his clinic as cases of hip disease. We can now make the differential diagnosis between this condition and hip disease, but many patients are still treated for hip disease. He cannot quite agree with Dr. Whitman in his statement that these cases are cases of coxa vara with disease of the neck of the femur and fracture taking place in disease. All his cases have been cases of epiphyseal fracture. By fracture of the neck he means a fracture of the surgical neck. On a living child it is difficult to make a diagnosis as to the site of the fracture except by the use of the X-ray. If cases could be examined immediately after the fracture has happened, it might be more easily accomplished; but ordinarily we see these cases after some time has elapsed, when the diagnosis is difficult. He believes that these cases of coxa vara illustrated are really a congenital deformity. Ordinarily, you have at the root of the neck an angle. In some cases it is nearly a right angle. He has seen this in children of two years; and in one case, one and one-half years of age, a right angle occurred.

He has found this condition in cases of congenital dislocation of the hip. He has the same idea of operation as has Dr. Whitman. We take away a wedge-shaped piece of bone with very good results. In some of his cases a long time had elapsed since the accident, and the abduction could not be overcome. Generally, after opening the joint, he did a resection of the head. In two cases upon which he operated there was not the least bony or fibrous union. The functional result of his cases is excellent. There can be no doubt that excision is not a very severe operation, so that one can easily do it. If the deformity is not too great, one should try to overcome the abduction, as Dr. Whitman does it. The paper of Dr. Moore has interested him very much. It is of the greatest importance that our physicians should know more of the subject-matter of this paper. The old method of treating fractures of the head of the femur were quite wrong; and, if you examine the results of the old method of treatment, you will be disappointed. In many cases union does not occur. In other cases there is shortening of the leg with abduction and outward rotation of the leg, and the patients suffer a great deal from pain. We now use a method similar to that described by Dr. Moore. The patient is anæsthetized, and a traction apparatus originated by Schede is used to pull the leg downward and forward. The limb is put in plaster of Paris, so that the patient is able to walk around with crutches, so that the dangers of pneumonia are avoided. He also would advise that impacted fractures should not be left as they are. The deformity should be overcome. If the fracture is allowed to remain as it is, you will have outward rotation and abduction of the limb. Separate the fragments forming the impaction, and you will obtain good union in good position of the leg.

Dr. **Wallace Blanchard**, of Chicago, said that he believed that rachitic coxa vara occurred more frequently than is supposed. Especially is this true in knock knee, in which the pelvis is tilted and the weight thrown upon one femur. The weight-bearing neck necessarily frequently gives way. A condition of coxa vara accompanying knock knees is often overlooked perhaps, especially in unilateral cases, because this condition is overshadowed by the dominant deformity. He can recall a number of cases of knock knee of one side that had been discharged, and noted upon the books as cured, in which there was a hitherto unrecognized coxa vara. He looked up the photographs of such cases, and ran across two cases in which this had occurred. He believes that it would be possible to find a considerable number of such cases in which there was a knock knee of one side and a tilted condition of the pelvis. Only after correction took place did the attitude indicate coxa vara. No X-ray pictures were made of some of these cases, so that he could not be sure, although he believes them to have been true cases of coxa vara. We have the records of a large number of such cases, and he intends to more closely go over the matter.

Dr. **A. R. Shands**, of Washington, wished to call attention to the similarity in the history of the patients as regards occupation. The history of the cases show that the patient had been working for eight or ten years for eight to ten hours per day in practically the same direction, as, for instance, in the case of a cutter or a tailor using a large iron constantly. The similarity may be noted in the case recited, in which the weight of the body plus the weight of the boards was borne on the same leg for a long period of time.

Dr. **Shaffer** wished to thank Dr. Whitman for the very able manner in which he had brought obscure points connected with the hip. He has reported a number of cases of acute coxa vara in which there was no lesion at the neck of the femur except in distinct bending. There is a tendency for such traumatic osseous lesions to revert to the normal under adequate protection. He has had a number of cases, not only as applied to coxa vara, but also as to knock knees, bow-legs, and curvatures after fracture in adolescence which proved that a great deal of our operative work is unnecessary, and that the treatment is simple. He wishes now simply to suggest that in many of these cases, perineal support and the opportunity given the patient, the tendency to revert to the normal under protection in adolescence is very great, and that this method should be used before any operative method is tried. Dr. Moore has kindly referred to what he did in the way of treatment of ununited fracture of the femur. His sequence in his report is about third or fourth. However, he would like to say that in 1889, without guide or surgical procedure to enlighten him, he worked out this problem. A man of forty-four with an ununited fracture of the femur came under his care. His case had been given up, and he was asked to make an effort to do something for him. It was then that he studied out the matter, and made use of a means devised at that time. He made traction in a straight line with abduction of the femur. The leg was clamped with a surcingle, and he succeeded in obtaining a most excellent result. He mention it only that he may be recognized as the originator of the method. The paper which he intended to present to-day would have brought this matter out.

Dr. Riely said that he had found the papers under discussion very interesting. He wished to mention the case of a girl of eighteen with a history of a fall from a carriage. She was first treated for rheumatism, was then turned over to the general surgeons, and was finally brought to the orthopedic department. No X-ray picture was taken. The patient suffered considerable pain about the knee. The leg was in a position of flexion with a great deal of abduction. An inclined plane was used. After three weeks' treatment he came to the conclusion that the diagnosis of coxalgia was incorrect, and an X-ray picture was taken. It was found that a fracture had occurred in an oblique direction, and that the fracture had evidently healed. The patient was operated upon by the Gant method, and the leg put in a position of abduction after rotating the foot inward. One year after there was perfect motion in the leg, with ability to walk as well as ever.

Dr. Peckham said that the treatment of fracture of the neck of the femur in the aged had been well brought out by Ridlon, and that he considered this method superior to the method given. The patient can be turned over on the side, and can stay there. In every case of fracture of the neck of the femur in the aged he approaches the patient with the utmost confidence of obtaining a perfect result, with no shortening. So far he has met with no failures in old cases. His oldest case was ninety years of age. In the aged, so called, his youngest case was sixty-nine. He has just removed the splint from a patient of eighty years in which the result has been perfect, with no shortening. He has a patient in the splint who continually wets the bed,—a condition seemingly favorable to the development of bed-sores. At the time the splint was applied there was one small bed-sore, which has since healed up. He has found no difficulty in keeping the patient clean.

Dr. H. P. H. Galloway, of Toronto, said that he was glad that Dr. Peckham had referred to his experience in the use of a splint. He would ask Dr. Ridlon to give his experience as to the toleration of patients when his treatment was used. At present he has a case of seventy-seven years of age with an impacted fracture of the femur, and he has had the greatest difficulty in keeping the case comfortable. At first he applied the splint which he has before employed with gratifying results; that is, a large plaster spica bandage. The patient was not comfortable with this bandage; and in a few days it had to be removed, and was replaced with a Thomas splint made under his own supervision. This he hoped would make the patient comfortable. However, it proved intolerable, and could not be kept on for more than three hours; and all dressings were removed, and nothing made use of except the old-fashioned sand bags.

Dr. Ridlon said that he had so often described the use of the Thomas splint that he would not otherwise have referred to it, had he not been asked to do so. The use of the Thomas splint is a very simple matter, and is only difficult when one expects to find it difficult. It should be made heavy enough to be entirely rigid, and bear the weight of the patient. It can be made of iron to stay bent instead of having a spring-like steel. Where it is reasonable to suppose fracture from inability to walk, where shortening is not more than three-quarters of an inch, he uses the Thomas splint in its simplest form. Where, owing to a bad inpaction, with shortening of more than three-fourths of an inch, or where the impaction does not exist, but the shortening is greater than three-fourths of an inch, he uses the splint with traction by attaching buckles to a band about the ankle and straps about the leg. With this splint the patient can have the head and shoulders raised up, and can be made perfectly comfortable. The patient can be turned on the side, and always is turned on the side once or twice daily, the bed can be changed, the back rubbed with alcohol, and the patient made comfortable without disturbing the fragments. He has had eight or ten cases since the last report. One was a fat old woman of seventy. Another case was eighty, with three-fourths of an inch of shortening when he came to the case. Another case past forty recovered without shortening. He likes very much the Thomas splint. He is able to put it on without assistance of any kind, and feel that the fracture is secure from the time that the splint is put on. In cases of impaction his results show outward rotation. One other point has been suggested to him by the paper by Dr. Whitman. An accident occurred to him in operating upon a case of infantile paralysis which had occurred nine or ten years previous to the operation. The leg was abducted about 30° and somewhat flexed. No X-ray picture was made, to find out whether there had been any change in the angle between the neck of the femur and the shaft. It was only intended to divide the muscles and bring the leg into place. The leg came out for about two-thirds of the way, and blocked solid.

The leg was forced into place with a consequent fracture of the neck. He believes that it is more easy to fracture the neck than to produce a dislocation.

Dr. H. Augustus Wilson said that all have had experience with the uncertainties in the use of the X-rays for diagnosis. This is illustrated strikingly in the following case: A boy eleven years of age, in playing football, fell with the ball beneath him, and twenty-one other boys on the first boy. There was some pain in the leg at the time. The boy resumed play for a matter of ten minutes, limping somewhat. The hip did not hurt, but the boy left the field because the hip was a little stiff. He saw him one month after. The leg was held in a position of medium abduction. The function of the leg was a little curious. In the position in which it was held it was possible to have complete rotation of the leg and have flexion and abduction, but all with the leg in the position of fixed abduction. A clinical diagnosis of impacted fracture of the femur was later confirmed by the X-ray. The X-ray showed very clearly a condition of impaction. It was advised that the fracture be broken up, and the fragments placed in a proper position. There was no shortening, as measured from the great trochanters. Our diagnosis as confirmed by the X-ray was not accepted, and the case was treated by active manipulations and movements. Eight months after he again saw the case, and found the condition decidedly changed. He was shown a radiograph which seemed to show that the original diagnosis was entirely wrong. There was now preternatural mobility in every direction. In addition there was decided fulness anteriorly and within the pelvis, and also posteriorly there was considerable fulness. The condition appeared to be a tubercular arthritis following manipulations. Hoffa by open operation found a fracture of the femur, with distinct evidence of tubercular arthritis present. The explanation of the whole thing was that the first X-ray negative taken was correct. Manipulations broke up the union, and lighted up a secondary tubercular arthritis. The X-ray which was taken subsequently showed the bone in position, with sufficient overlapping to conceal the line of fracture. Another case illustrates a point to which Dr. Whitman referred in his paper. This was a case in which the neck of the femur was fractured in an attempt to reduce a congenital dislocation of the hip. It was not known at the time that the fracture was produced. If not for the post-mortem findings, we would not have known that the fracture occurred. There was absolutely no evidence at the time. He experimented later on a cadaver in the production of such a fracture, and found it very easy by the leverage of the lower end of the femur by extreme hyperextension. The leverage force was found to be such as would produce a fracture of the neck without apparent great force being used. He agrees with Dr.

Whitman in his statement that fractures are more common than supposed. In the mind of the general practitioner there are but two conditions, rheumatism and hip-joint disease, the latter term apparently covering every disease of the hip joint. He feels that Dr. Whitman has done a very great service in attempting to have the general practitioner make an early diagnosis, and based upon that an idea of the rational treatment.

Dr. R. **Tunstall Taylor** wished to place on record three cases of traumatic injury of the hip joint in which there had been displacement of the epiphyseal end of the neck upward. The result of the condition was that the leg was held in abduction. Abduction and shortening should be present in most cases. In his cases there was lengthening.

Dr. **Hosmer** placed on record two cases of fracture of the neck of the femur in children. One case occurred in a boy seven years of age, the other in a boy nine years of age. Both resulted from slight traumatism, one the result of a four-foot jump. The boy complained of no pain. Skiagraphs taken on the well side showed both a deformed neck and head, the neck coming off at almost a right angle from the shaft and showing partial transplantation of the head, so that from the end of the neck it had partially slipped around to the top. In this case the rachitic condition of the neck of the femur accounted for the ease of the partial fracture with slight trauma as a cause. It does not seem to him that the treatment of this condition is quite as simple as one might infer from the discussion. Such a condition calls for the exercise of good judgment on the part of the surgeon. With regard to the principle of treatment advocated by Dr. Whitman in placing the limb in extreme abduction, it seems to him that where the line of fracture is in one direction one may be able to secure very correct apposition of the fragments, whereas, if the line were reversed, it seems to him that it would fail to accomplish this. The method of traction as advocated by Dr. Moore, the traction being made in two directions, is another application of what has been advocated by two of our members. In some cases it seems that we should exercise a preference for one or the other methods of treatment. In old people or very fat or clumsy people the position of extreme abduction might be far more uncomfortable and more difficult to maintain than the method of treatment advocated by Dr. Moore. In reaching a decision as to treating an ununited fracture, whether to treat by mechanical means only or by combined operative and mechanical procedures would be a very difficult matter at times. The question of how old a fracture we are justified in treating by mechanical means alone is also a difficult one. Where the capsule is interposed between the head of the femur and the fracture and the capsule is torn through, it is no use to institute such treatment. In some cases this might not be shown by the X-ray. In passing, he cannot refrain from objecting to the use of non-absorbable material for sutures, especially in epiphyseal fractures. He believes that the use of absorbable material is ample to maintain the position with mechanical treatment, and will give less trouble later on than will silver wire. The nail is not open to quite the same objection. However, he believes the suture to be sufficient, and that in this manner the abduction of the leg can be overcome.

Dr. Joel E. Goldthwait, of Boston, called attention to a case of intracapsular fracture of the femur which had been reported in which a perfect result was supposed to have been obtained. The patient had been walking about, and was shown and accepted as a perfect cure. Subsequently the patient died of another affection, and the specimen which was obtained showed that the result had not been perfect, but that the steel nail which was still in place had been sufficient to effect a functional union. Personally, he has used the method advocated by Ridlon in the treatment of cases of such fractures occurring in older patients.

Dr. De Forest Willard said that he believed in nailing the fragments in certain cases, and that the treatment in recent cases was that method which best and surest gives fixation which we need to get quick union. In those cases reported in which steel and silver nails have been used there has been little irritation, giving a good and sure method of union. In the Thomas splint we have a very valuable addition to our treatment, especially in old people. Such patients must be got out of bed early, otherwise they will rapidly sink. The great trouble is that we have so much opportunity for version that outward rotation cannot be obviated. We can make traction or simply prevent version.

Dr. Porter, in closing, mentioned two cases in which there had been a separation of the epiphysis. Both were cases of simple coxa vara. In one case the separation of the head from the neck was due to inability of the epiphyseal portion to follow the leg in extreme abduction. The second case was one of traumatic separation. In a case of impacted fracture of the femur the Thomas hip splint had been used with perfectly satisfactory results. The splint had been removed at the end of six weeks, and patient walked with a cane at the end of eight weeks.

Dr. Whitman, in closing, said he would again call attention to the three classes into which injuries of the upper extremity of the femur in young subjects should be divided : (1) simple traumatic depression of the neck of the femur; (2) partial separation of the epiphysis of the head; (3) secondary fracture of a previously weakened or deformed neck (coxa vara).

In the first class and in all cases of so-called impacted fracture, whether in childhood or adult age, one should attempt to straighten the distorted part by forcible *abduction* of the thigh, under anæsthesia, to the normal limit, and by fixing it for a sufficient time in this attitude by a plaster spica bandage. Complete fracture in adult age might be treated successfully by the same method. Failure of treatment or non-treatment was usually excused by the traditional plea of age or feebleness of the patients; but, as he had pointed out in former papers, at least two-thirds of all the cases were in vigorous subjects, many of them young adults and children, and favorable subjects, therefore, for the treatment that offered the best chance of success.

Dr. Painter's case had been seen recently. The functional result was very good; but the neck of the femur with its supporting nail had, under use, become depressed to an angle of about 75° with the shaft. It should be borne in mind that, as the neck of the femur was subjected to great strain, it should be protected for a long time after fracture. For this reason the case mentioned by Dr. Moore, in which the patient began to use the limb in seven weeks, seemed rather remarkable.

Dr. Moore, in closing the discussion, readily conceded that the method advocated by Dr. Whitman would produce the best results in children, but was equally ready to suggest that he failed to grasp the condition in old people. We are being taught that the neck of the femur is no different from any other bone. We get ununited fractures in young people, and they unite better than in those from twenty to forty years of age. Dr. Hoffa and Dr. Whitman make a good point when they say that we would not allow an impacted fracture to exist anywhere else in the body, and yet in the old-time treatment the only hope for a good result was an impaction. In answer to the question the treatment which he has advocated has been instituted seven weeks after the fracture occurred. Old people do not walk on the foot at once, because they are afraid of it. Good results can be obtained with the Thomas splint and the Ridlon treatment, but it is not to be recommended to the general practitioner. These men cannot apply this splint successfully.

X.

EXTIRPATION OF THE TENSOR VAGINA FEMORIS FOR THE CORRECTION OF INTERNAL ROTATION IN SPASTIC PARAPLEGIA (LITTLE'S DISEASE).

V. P. GIBNEY, M.D., NEW YORK.

The persistence of pigeon-toe depending on internal rotation is well known to both the neurologist and to the orthopedic surgeon. We are able by myotomies and myoclases to correct the crural adduction and the equinus so prominent in these cases of spastic contraction or spastic paraplegia known as Little's disease. Time and again these factors in the deformity are eliminated by vigorous and persistent orthopedic measures. We have rather prided ourselves on contributing this much to a class of cases that are so notoriously rebellious to treatment. The transposition of tendons has been made to overcome the remaining rotation. Extreme over-correction by manual force of the internal rotation has been often resorted to; and this position has been maintained for months, with usually a relapse sooner or later.

During the last few months my attention has been called to this subject while treating the following case:—

Ada deL., aged nine years, of Colon, Panama, was admitted to the Hospital for Ruptured and Crippled June 18, 1900, for the treatment of spastic paraplegia. She was accompanied by a maternal grandmother, who knew little of the early history. She did tell us that she was late getting on her feet, and that she walked with much difficulty, inco-ordination being a distressing obstacle to the use of her lower limbs as well as the right upper extremity. There was a history also of convulsions in infancy. When she entered the hospital, there was impairment of co-ordination in speech as well as in the use of the limbs. The feet were in marked equinus, and

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Presented at the eighteenth annual meeting of the Association at Atlantic City, N.J., June 8-10, 1904.

the thighs were moderately scissors-legged. She walked with great difficulty, and presented, both in walking and standing, the characteristic spasticity of her class. On July 31, 1900, double Achillotomy was performed, and the feet were dressed in moderate equinus; that is, the deformity was not fully corrected. On Sept. 3, 1900, the plaster of Paris was removed, and she walked a little better; that is, the equinus was not so marked as at first. The plaster of Paris was reapplied, to be finally removed Oct. 22, 1900. Her gait was not much improved. On Nov. 7, 1900, she was discharged, not improved.

She was readmitted on Nov. 3, 1903, walking about as poorly as when she left the hospital. Her gait was very unsteady, and she seemed on the point of falling every step she took. The thigh could be forcibly abducted to about a straight line with the vertical axis of the side of the body. Both ankles were held in rigid equino-varus. There was the same incoordination in movements as observed before. On November 18, under ether, the adductors, both sides, were broken down by tenotomy and myoclasis, so that extreme abduction could be made. The Achilles tendons were again divided, and both limbs were put up in plaster of Paris, so that, when the dressings were completed, there was extreme abduction of the thighs, outward rotation, and the equinus corrected. The plaster extended from the toes to the thorax, a double long spica. The plaster was removed December 10, and she was placed in a wheel-chair. The spastic element was still a prominent feature, yet contraction of the adductors was corrected. In March she was walking about the ward without any equinus, yet there was some adduction and some toeing-in, due to internal crural rotation. We felt that all that could be done mechanically or surgically had been done, and that home-drilling and muscle-training would insure her a much improved gait as time went on. Accordingly, her discharge was ordered; but the grandmother insisted on something being done to correct the pigeon-toe. We argued that time and muscle-training would accomplish much in this line; but she was obdurate, and pleaded with us to "cut some tendons about the ankle, and not send her out until this phase of the deformity had been corrected."

My mind dwelt on tendon transplantation, and I selected the tensor vagina femoris for operation; and yet, when I came to consider the broad insertion to the fascia lata, I felt that extensive dissection must be made, and I cast about for some other solution. Reflecting on the internal rotators and their activity, I concluded that one of the three could be spared. The gluteus medius and the gluteus minimus were rather deeply located, so the tensor vagina femoris presented as the sacrificial lamb. So on the 27th of April, under ether, I had no difficulty in finding the body of the muscle, and detaching it from the crest of the ilium *en masse* through a curved incision. All except the tendinous attachments was removed, and the wound closed with catgut. There was very little hemorrhage, no ligatures necessary; and the limb was put up in outward rotation, plaster of Paris being applied from the ball of the foot to the free ribs. There was no reaction, the rectal temperature never going above 99⅕°. On May 16 the plaster of Paris was removed, wound found healed throughout, and the limb lay in outward rotation. She was put on her feet at the end of two or three days, and walked with the foot in eversion.

On May 24, under ether, with Professor Hoffa and Dr. Spitzy, his assistant, present, I repeated the operation on the left side, following out all the details of the right. The limb was put up in plaster of Paris, with the foot in eversion. On June 3 the plaster of Paris and dressings were removed, and the wound found to be healed throughout. The case was seen at this time by Dr. Hoffa, Dr. Bradford, and Dr. Charles Powers, of Denver.

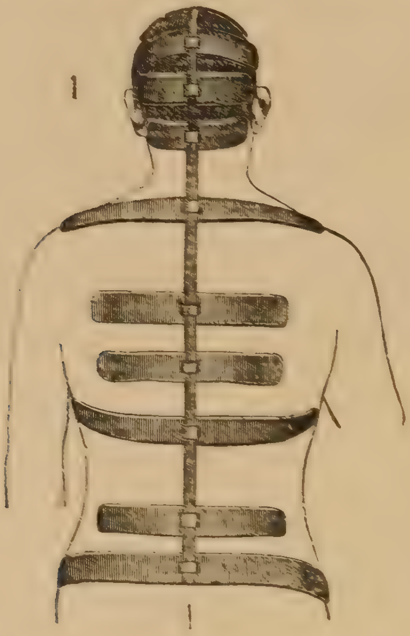
It is of course too early as yet to predicate a result; yet, theoretically, I am justified in assuming that the crural internal rotation will not recur, and that the child's gait will improve the more rapidly for having this strong internal rotator removed beyond return.

XI.

THE HEIDELBERG SPLINT: A NEW BANDAGE.

PROFESSOR DR. O. VULPIUS, HEIDELBERG, GERMANY.

We possess a large variety of splints, both simple and compound. But considering the qualities which a good splint should possess, and the degree to which the splints hitherto known answer our requirements, we find that they leave much to be desired. Let us therefore give a brief résumé of the qualities which the ideal splint should possess. The construction must be simple, so that the splint may be adapted to all cases without difficulty; the instrument should allow fixation in a secure manner; it should be light, but nevertheless strong; it must be easy to carry. The bandage splints in use at present do not combine all of these qualities. In order to be



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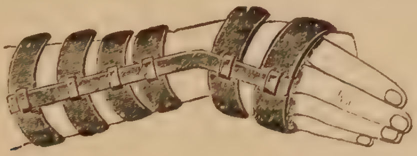
provided with bandages for all possible cases, it is necessary that the physician or the hospital should have a large number of all assorted sizes at hand. Nevertheless, it is possible that at

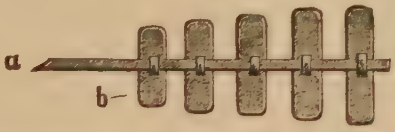
a given moment the correct size may be wanting, and accordingly that the fixation produced may be insufficient. Our Heidelberg splint appears to fill this gap in the surgical armamentarium.

The splint is composed of an aluminum stem of rectangular



shape and of aluminum bracelets of different lengths, each of the latter having a slit in the middle of its long dimension to allow the introduction of the stem. Although the stem is indurated and firm, it can be bent on both surface and sides.

How can we avail ourselves of this instrument in any given case?



A stem of the requisite length is procured. Then a series of bracelets of different lengths are applied according to the increasing or decreasing circumference of the member. In cases where the slits happen to be slightly bent, they can be straightened by means of a special pair of pincers. This serves at the same time, using slight pressure, to fix the bracelets in the required place. The stem is then adjusted to the long dimension of the member, the bracelets to its circumference, after which the splint is fixed by means of bandages.

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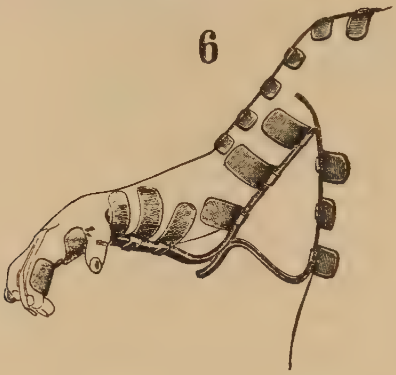


What are the advantages of our new instrument?

(*a*) With very simple material one can supply his own needs without having to resort to the aid of the truss-maker.

(*b*) With a bandage corresponding in size to that of the member in any given case, one can easily modify the form of the splint, and by this means very delicately alter the position of the joints.

(*c*) The same two materials can be used to construct a small splint for the hand, and similarly a splint which will allow the fixation of the trunk and the head at the same time,—an aim which hitherto could be accomplished only with great difficulty.

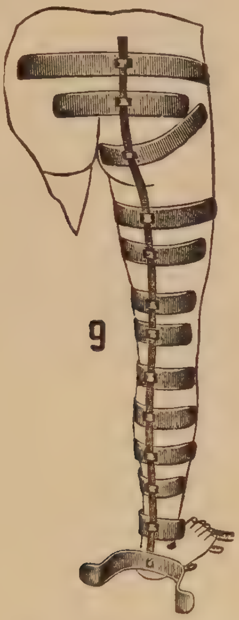
(*d*) The splint is very light, but nevertheless very strong and firm.

(*e*) The fact that the bracelets are adapted to the surface of the member give this instrument the stamp of a shell splint of Hessing.

(*f*) The splint can be very thoroughly cleaned and even sterilized.

(*g*) Above all, material sufficient for the preparation of a large number of splints may be packed and transported without requiring much space.

For the country physician it is most convenient, enabling him at all times to take into his carriage or on his bicycle sufficient material, so that he may not be at a loss in case of unforeseen accident. And especially in times of war a great advantage may be gained by conveying in the infirmary car a large number of splints which allow of rapid, but nevertheless precise adjustment, notwithstanding the large numbers of the wounded during the battle. It may also be mentioned that our splint, owing to its property of being modelled, will allow a change in the dressing of a wound—even in a case of complicated fracture—without needing to be displaced or removed. The curve of that part of the stem which remains free of bracelets enables us to pass the straps between the skin and the splint. We believe that the advantages of the Heidelberg splint are so evident that it is useless to insist in more detail upon our own experiences. We hope to be of service to you in informing you of this invention, which is too simple not to be good.



XII.

ON THE TREATMENT OF ACUTE AND SUB-ACUTE INFLAMMATIONS OF THE KNEE JOINT BY APPARATUS PERMITTING LOCOMOTION WITH PROTECTED ANTERO-POSTERIOR MOTION AT THE JOINT.

NEWTON M. SHAFFER, M.D., NEW YORK.

The speedy relief and comfort which follows the application and use of the apparatus described by the writer in the *Annals of Surgery* for October, 1898,* in cases of subluxation of the semi-lunar cartilage at the knee joint, are familiar to all who have pursued this plan of treatment. It is not unusual for a patient with a subluxated cartilage to resume at once, and without pain or fear of a recurrent displacement, all his usual habits of life and activity. A recent case coming under my observation and treatment will illustrate how speedy and complete this relief may be:—

A boy of seventeen, an inmate of one of our popular boarding-schools, while playing football last autumn, received a severe injury to the right knee. With the knee in a slightly flexed position, it sustained a severe impact, the force being lateral and from the distal side. Immediate disability followed, with heat, pain, and swelling. When I saw him about ten days later, there was still a marked effusion within the capsule of the joint, a distinct protrusion at the joint line between the inner condyle and the head of the tibia, and a very marked lateral mobility. The patient was unable to walk without crutches. Indeed, he was unable to bear his weight upon the injured member. Within four days I had applied the apparatus described in the *Annals of Surgery* with the joint about to be described, and within a week he was walking without any support except that afforded by the apparatus. Within two weeks he was dancing and riding the bicycle. After eight months' treatment his recovery has been uneventful and complete.

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* "On the Cause and Mechanical Treatment of Subluxation of the Semi-lunar Cartilage of the Knee Joint," *Annals of Surgery*, October, 1898.

Presented at the eighteenth annual meeting of the Association at Atlantic City, N.J., June 8–10, 1904.

With a variation which is individual rather than pathological, this is the history of many patients treated during the past few years. The ages of the patients vary from fifteen to fifty-nine years. Both sexes—with the female sex in the majority—are represented; and it includes as well a considerable number of women who may be described as portly, one patient weighing about one hundred and ninety pounds.

It is not my intention to review at length the subject of the mechanical treatment of semi-lunar dislocations, as I have already done so on a previous occasion.* Almost without exception those patients recover who follow the surgeon's advice, who afford him co-operation, and who give him an opportunity to frequently revise and modify the support. Without this, failure is apt to occur; for an inefficient support is probably worse than none at all.

The following incident, occurring to a patient under treatment for subluxated semi-lunar cartilage, makes it apparent that the apparatus described in the *Annals of Surgery* has a much wider range of applicability than that for which it was originally intended:—

Mr. A. S., aged eighteen, who had been under observation and treatment for about three months for subluxation of the semi-lunar (internal) cartilage, had occasion to attend a dance one evening, in connection with his graduation from a popular private school, prior to his entrance to college in 1901. He removed his apparatus to attend the dance, contrary to my instructions. During an interval between the dances, while "skylarking" with some friends upon a winding staircase, he slipped and fell, producing an immediate recurrence of the dislocation of the cartilage. He got home with some difficulty, and came to me the next morning on crutches, bringing his apparatus with him.

The knee joint was very much distended, with an effusion. It was hot, painful, and tender. I advised the boy to go home, where I promised to soon follow him and apply a plaster-of-Paris splint. He stoutly maintained that this was impossible, as he was obliged to attend his college entrance examination that day, and that he had brought his brace with him, hoping that I could adjust it in some way to meet the exigency of the occasion. There was no time to apply a gypsum splint. He was on his way to the examination hall even then. The condition of affairs seemed urgent enough to warrant my complying with his request. With the aid of wrenches the outline of the brace was made to conform with the greatly altered joint, and the apparatus was applied. With the support afforded by the crutches he attended the examinations for three days.

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* *Op. cit.*

At the end of that time the patient had experienced much relief, although he had bent his knee for several consecutive hours at the examinations, and had used it much as he otherwise would have done, had it not been affected, except that he used his crutches in walking. The effusion, pain, and heat had subsided very considerably. He walked across the floor of my office with only a slight limp, in his apparatus, without his crutches. The "pin" inserted in the joint to arrest motion just inside of the point indicated by Nature was, however, too short to be fully effective. While he waited in my office, this pin was made longer. With this change he experienced no pain, and walked better. Indeed, he experienced so much comfort and relief that, as a matter of test, I directed him to go without his crutches, to walk moderately, and report to me the next day.

Rapid improvement followed. He soon was walking about the streets, with a gradually decreasing effusion; and at the end of about two weeks, and after he had commenced walking as above, the effusion had disappeared. He went into training for a running match soon after he was discharged as cured the following spring, and he came out second in the race.

Mr. H. R., aged twenty-two, while attending a football contest, as a spectator, at New Haven in October, 1901, experienced—without any apparent cause, except a slight slip—a violent pain in his left knee, and was with difficulty conveyed to his home in New York. I saw him the evening of the accident, if such it may be called. The patient had, about ten years previously, been under my care for hip-joint disease upon the opposite side (right), from which he had recovered with slight deformity and limited joint motion.

The history developed at the time of my examination showed that for several years he had noticed that the left knee was occasionally quite "puffy" and painful, and that there were times when he was obliged to favor it. He had not, however, consulted any surgeon regarding his condition, and had allowed the matter to go on, hoping for a spontaneous cure. The knee had been troubling him for several days prior to his New Haven trip, and he had attended the game largely on account of guests whom he had invited. He described the attack as coming on very suddenly, and with great pain, and without any apparent cause, except, as above stated, a slight misstep. Certainly there was much disturbance in the joint. The capsule was so distended as to suggest some dense, semi-solid substance; and I could not satisfy myself that the contents of the capsule were fluid until the use of the hypodermic needle demonstrated the existence of a clear serous fluid. I applied the usual remedies locally, the heat being combated by ice. The patient remained recumbent. No splints were employed. The effusion and heat diminished very gradually. About three weeks after the first symptoms I applied the apparatus described in the *Annals of Surgery*, there still being considerable effusion and some heat, and about one-half of normal flexion in the joint. The "pin" was carefully located to arrest motion just where all strain would be taken from the crucial ligaments, and the patient was instructed to walk. Inside of a week he was walking about as much as was customary with him; and on December 19 he stopped treatment, being, as he said, so well that he did not need any surgeon. He wore the brace for another month or so, when he discarded it. The effusion has not returned; and the joint, about a year ago, was normal to all ordinary tests.*

I could add to these histories many others of patients who have recently been under my care. They all give the same history as regards the immediate and also the permanent relief—even in cases of acute synovitis—afforded by the use of the "pin-stop" apparatus, placed as it is in the eccentric joint of the brace. As soon as the really acute symptoms become modified, and long before the effusion disappears, the support can be applied.

The use of this protection to the knee—the introduction of this "stop" which saves the ligaments from strain, and which supplies to the unprotected knee an artificial glenoid cavity, or an olecranon process—serves again to re-enforce my statement that in joint inflammation "within the limit set by Nature, motion, I believe, to be harmless."†

In chronic synovial disease of the knee I have applied this apparatus only once. In this case, a young girl of fifteen, with a history covering ten years, and with about 40° of motion, the application of a "pin stop" has been followed by relief from pain, a cessation of limping, a modification of the morning stiffness, and an increase of the antero-posterior motion at the joint. The swelling has also become reduced,—about one-half an inch in six months.

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* "*June 23, 1904.*—An examination of the patient to-day shows very marked improvement. The swelling and thickening about the knee are very much modified. The patient can now quite fully extend the knee-joint without pain, and the arc of flexure has increased over 20°. The patient walks about, attends to business, and is most comfortable in the apparatus, which causes him much comfort and no annoyance. The prognosis is most favorable."

† Transactions American Orthopedic Association, vol. ii. p. 100.

In an adult with a history of several recurrent injuries, covering several years,—with a strong suggestion of a joint inflammation of a chronic nature, but not apparently tuberculous,—relief has not been marked. The joint motion, however, has increased under the use of the "pin stop," and the apparatus gives much comfort.

The apparatus has been fully described in the *Annals of Surgery*.* It is not intended to produce traction, as such, "but to prevent every motion at the knee and ankle, except antero-posterior motion. In short, to turn the knee into a true hinge joint, removing entirely the rotation of the tibia. . . . The important part of the apparatus . . . is the joint at the knee, which is so arranged that it will stop the extension just at the point of comfort to the patient; and this point of comfort represents an absence of strain upon the knee-joint ligaments."

In order to demonstrate the "pin stop" part of the apparatus, which is the adjustable "olecranon" of the knee joint, I submit herewith a drawing showing it. (See Fig. 1.) It is placed in the outside bar of the brace in the upper part of the eccentric knee joint of the apparatus. The centre of motion in the apparatus is placed half an inch, more or less, back of the long axis of the outside bar. Into the "jaws" of the joint thus created (see Fig. 2) is inserted a pin curved to meet the arc of the artificial centre in the knee of the apparatus. The "pin stop" should be made long, so that the surgeon, in adjusting the appa-

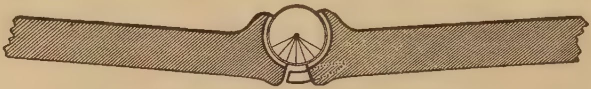

FIG. 1.

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*See foot-note on page 98.

ratus, may gradually file it down until the point of contact of the pin with the lower half of the joint is the one required. This point of contact should not only represent comfort to the patient, it should stop at a point where there is an audible "click" with each step the patient takes. The apparatus as applied to a patient is shown in Figs. 2 and 3. When this is accomplished, we may know that our patient is safe, and that he can walk, even with an effusion within the capsule, with a better prospect of cure than with the ever-ready and convenient but, as I believe, the very inefficient plaster-of-Paris splint.

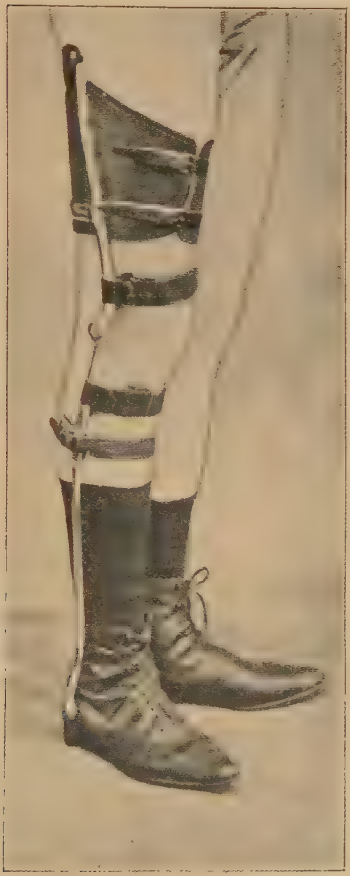

FIG. 2.

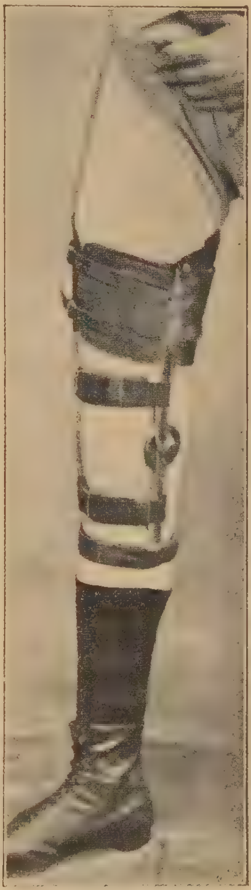

FIG. 3.

XIII.

THE INFLUENCE OF GROWTH ON THE COURSE AND TREATMENT OF CONGENITAL CLUB-FOOT.

A. B. JUDSON, M.D.

A baby gains in length about eight inches in his first year, in which a congenitally deformed foot, if neglected, becomes more obnoxious and obstinate with each added month. The oft-quoted line, "Just as the twig is bent, the tree's inclined," has a remarkably practical and appropriate application in the presence of a newly born club-foot, which seems to be held out by the little stranger in a sort of mute appeal for relief. In this plastic and formative stage, before the weight of the body interposes its mischievous influence, the misshapen structures are sure to yield, no matter how rigid and unpromising they seem to be on the first examination, to the gentle and firm pressure of continuous leverage. They are so sure to give way to such pressure applied with due persistence that, if over-correction is not secured before the time at which a child ordinarily begins to walk, it will be in order to inquire whether the blame shall fall on the physician or the parents who may have failed, as they unfortunately often do, to follow instructions or to bring the case often enough to the attention of the physician.

The outlines reproduced in the figure were taken at various dates, and were arranged together before the camera so that they exactly represent the size of the feet in the successive stages of growth and treatment. In the earlier months the simple problem was to keep the feet as near as was practicable in their natural appearance, so that they would grow to a normal instead of an abnormal shape, refreshing the significance of Andry's definition of orthopedic surgery as the art of leading a child to grow straight. The means employed are a secondary matter. That method is imperatively the best which

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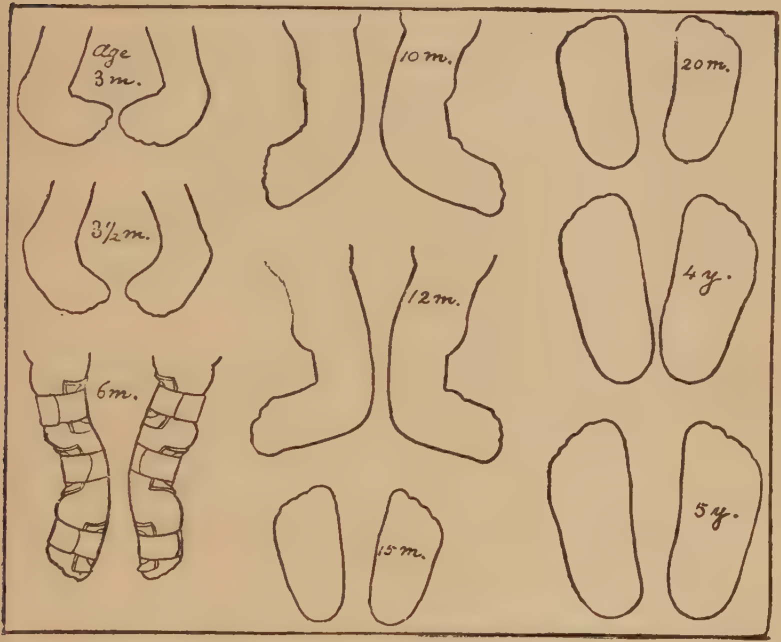
Presented at the eighteenth annual meeting of the Association at Atlantic City, N.J., June 8–10, 1904.

agrees with the convenience of the physician, whether it is prescribed by authority or invented to meet the emergency of the case in hand. Some will succeed with one method, and others with another. Every kind of orthopedic appliance and procedure is attended from the nature of the case with inconvenience, discomfort, and trouble. It has been noticed that a surgeon who invents or modifies an instrument or method for the treatment of congenital club-foot is more likely to make it more conspicuously useful than his successors, which is entirely natural, since he and the immediate attendants of the patient, inspired by his confidence and foreseeing success at every stage, cheerfully combine in a determination to meet the disagreeable conditions of success. The main thing is to keep the little foot as close to the normal condition as possible, or over-corrected, while natural growth leads to a perfect result.



The figures show the increase in the size of a child's foot by natural growth, of which advantage may well be taken in the correction of talipes equino-varus.

The length of a child at birth is about twenty inches. In the first six months he grows five inches, and in the second three inches, or eight inches for the first year. In the second year he grows five inches, in the third three inches, and in the fourth two inches, and by the end of the fifth year he measures forty inches instead of twenty. After that the annual growth is about one and two-thirds inches, with a slight acceleration just before puberty. The outlines shown cover five years in the case under consideration.

Of course the difficulties of treatment are greatly increased when the child begins to walk, when the problem presented is how to make the patient strike the ground with his feet at such an angle that he will stamp his feet straight instead of crooked; and then his growth is still a prime consideration, as it adds increasing weight and activity, which, if directed, will promote recovery in the most effective manner, or, if neglected, will surely lead to resistant and inveterate deformity.

It will be recognized that the rate of growth as stated is approximate. It is believed that it is far from uniform from year to year, but is now rapid and again slow. It would therefore be well if its fluctuations could be foreseeen, making possible especial orthopedic efforts when growth is rapid and relaxation of treatment when it is proceeding more slowly. It is thought that the graphic presentation made in the figure of the effects of five years of growth in a given case will emphasize the practical importance of this subject.

XIV.

REPORT OF EXPERIMENTS TO DETERMINE WHETHER PLASTER OF PARIS CONTRACTS OR EXPANDS IN SETTING.

J. TORRANCE RUGH, A.B., M.D., PHILADELPHIA.

The contraction or expansion of plaster of Paris during the process of setting has always been an undetermined point; and among writers upon the subject the matter is rarely alluded to, and, even if mentioned, there is no definite statement thereabout. That it or the body material with which it is incorporated contracts in setting is firmly believed by most general surgeons and practitioners; and, in consequence of this belief, many refrain from using it. The ill results which occasionally follow its use are always ascribed to the contraction of the plaster; and, when such results are published, they militate against its employment by others, and so deprive the surgeon of a most useful assistant and the patient of a most helpful remedial agent. It is needless to say that the real cause of the unfortunate results has been the careless or ignorant method of application on the part of the surgeon, and he may expect such until he familiarizes himself with its use and action. The medico-legal aspect of such cases also furnishes to many, a cause for hesitation, as damages have been awarded (and properly so in many cases) against physicians for the injuries received by patients from pressure by plaster splints. Brains and common sense are two essentials in the successful use of plaster of Paris; and, if one has these, and will utilize them, the confidence engendered thereby will prevent misapplications.

In a symposium on plaster of Paris during a former meeting of this Association, opposite views regarding this question were expressed by several of the members; and this gave to the writer the idea of determining which view was correct. We felt that the results would sufficiently repay the time and labor necessary to the work. Experiments were therefore

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Presented at the eighteenth annual meeting of the Association at Atlantic City, N.J., June 8-10, 1904.

begun with pure plaster of two kinds, with body materials, with plaster bandages combining both these varieties; and there was also noted the effects of salt and alum upon the setting. These have been tabulated together with other facts of interest and importance. The appliance used in the experiments was devised by the writer, the idea originating with the ordinary dynamometer used for testing the strength of the hands, though very much larger.

Variety.	Body.	Temp. of water.	Salt.	Time in setting.	Contraction.	Expansion.	No change	Amount.	Time of experiment.
1. Dental . . .	None	65°	None	2 min.		Yes		1-120 in.	12 hrs.
2. Medium . .	"	65°	"	8		"		1-96	12
3. "	"	65°	Yes	4		"		1-96	12
4. "	"	110°	None	5		"		1-110	10*
5. Dental . . .	"	70°	"	3		"		1-96	12
6.	Gauze	72°	"	†20		"	Yes		12
7.	Crinoline	65°	"	†1 hr.			"		12
8. Dental . . .	Gauze	70°	"	5 min.		Yes		1-120	2
9. "	"	100°	"	3		"		1-108	2
10. Medium . .	"	100°	"	12		"		1-108	12 min.
11. Dental . . .	"	65°	Yes	1		"		1-96	10
12. Medium . .	"	65°	"	4		"		1-96	12 hrs.
13. Dental . . .	"	100°	"	1		"		1-96	10 min.
14. Medium . .	"	100°	"	3		"		1-108	5 hrs.
15. Dental . . .	"	80°	None	2		"			12†
16. Medium .	"	80°	"	5		"			12*
17. Dental . . .	"	80°	Yes	2		"			24*
18. Medium . .	"	80°	"	3		"			24*
19. Dental . . .	Crinoline	100°	None	5		"		1-120	12
20. Medium . .	"	100°	"	9		"		1-108	10
21. Dental . . .	"	70°	Yes	3		"		1-96	5
22. Medium . .	"	70°	"	6		"		1-96	5
23. Dental . . .	Gauze	80°	Alum	3		"		1-96	12
24. Medium . .	"	80°	"	6				1-108	10

* No change occurred after the first half-hour. † Drying.

‡ These tests were made with a round, smooth stick instead of the dynamometer: hence no register or estimate of the amount of expansion, though it was sufficient to allow the plaster to be slipped off the stick with ease.

While the actual expansion universally observed was very slight, amounting to not more than the one ninety-sixth of an inch, yet it was sufficient to prove that there is no cause for the fear that pressure sores may develop from contraction of the plaster bandage, which fact in itself is of no small import to the profession at large, as it will serve to render the users of this agent more cautious and more intelligent in their methods of applying it.

ABSTRACTS.

SCOLIOSIS.

259. The Plaster-of-Paris Bed in the Treatment of Scoliosis and Kyphosis. By Summers. *Muench. med. Woch.*, No. 19.

This article is a recommendation and description of the technique of the plaster-of-Paris bed in the treatment of kyphosis and scoliosis.—*Jour. Abst. Deutsch. med. Woch., D. Townsend, Boston.*

260. A Further Contribution to the Study of the Scoliosis of Sciatica. By Ehret. *Jour. Am. Med. Ass'n,* May 7, 1904, No. 90.

Scoliosis Consecutive to Sciatica.—Ehret presents further arguments and illustrative cases to sustain his theory that the scoliosis observed after sciatica is due to the position of the leg maintained by the patient in order to relieve the pain, with compensation on the part of the spine to render it more comfortable. In all cases of sciatica, therefore, attention should be paid to the spine, and a fixation cast applied in rebellious cases in the endeavor to prevent spinal deformity later. The water-glass cast should extend from the toes to the hip, and keep the limb in the primary, not compensated, "self-relief" position. He has been able by this means to ward off impending scoliosis in fourteen cases. When the "self-relief" position is only slight, it can be maintained with cushions, and compensation on the part of the spine thus be avoided. He keeps the cast on from ten to twenty-one days. When the scoliosis is once established from sciatica,—even long past,— much benefit can be derived from permanently raising the height of the sole on the affected side. With an inner sole 3 cm. thick, he succeeded in eighteen months in completely curing a pronounced scoliosis left from a sciatica five years before. The particulars of five cases are given in detail, the patients twenty-eight to forty-six years old, with diagrams to show the mechanism of the developing scoliosis.—*Abst. Mitteilungen a. d. Grenzgebieten, Jena,* vol. xiii., No. 1, *Robert B. Osgood, Boston.*

261. Some Orthopedic Exercise Apparatus and its Application in my Treatment of Scoliosis. By Schwarz. *Zeit. f. orth. Chir.*, XII. Band, 4 Heft.

The author describes apparatus he has used in his orthopedic establishment at Prag.

1. *Fluegelbrett Seeger's.*—Simply an inclined ladder with a round bolster applied under the deformity; applicable especially in round shoulders.

2. *Kraftmesser.*—Patient stands against a board, and grasps with his hands two handles fastened to cords running over pulleys and weighted at the other ends. A wooden bolster is fastened to the board, so that it presses against the maximum curve, and counter-pull is made by an elastic belt running from the wooden pad about the front of the patient and fastened at the side of the board.

3. A modification of the Lorenz roller, whereby the patient has a support for the feet on an inclined plane, and so can correct himself by grasping the rungs of a small ladder extending from the roller behind.

4. *Rhachilysis.*—A modification of one of Barwell's. Patient sits on an inclined plane, and the head is extended. Correction is active, the hands grasping handles which are connected, by means of levers, with two elastic girdles for pull and counter-pull.

5. A detorsion apparatus modified from Bonnet. The correction depends upon a pressure pad connected by means of a lever with a handle which the patient grasps. The author believes the detorsion accomplished almost ideal, because the pressure at the beginning of the movement is in a sagittal direction, and is gradually changed into a diagonal one as the patient increases the pull. The article contains a number of illustrations.—*Henry O. Feiss, Cleveland, Ohio.*

SPINE.

262. The Problem of Absolute Obliteration of the Spondylitic Hump. By Julius Finck, Charkow. *Zeit. f. orth. Chir.*, xii. 4.

In order to accomplish this end, treatment must take place while the primary process is still flourishing and before accessory deformities have begun.

During the acute stage the patient is laid horizontal. After that he is gradually raised by propping him up under the gibbosity. For this purpose a Lorenz plaster bed is best suited. By placing layer after layer of cotton pads, the correction will gradually take place. When the pad becomes too high, a new plaster bed is made. This method will not suffice for larger knuckles. In these a preparatory treatment of manual extension is used.

The after-treatment consists in a corset with the plaster bed still kept up at night. A table of 16 cases is appended.

263. Lumba Abscess. Report of Six Cases Treated by Aspiration and Injection of Iodoform-glycerine Emulsion. By Alfred Irving Ludlow, Cleveland, Ohio. *Jour. Am. Med. Ass'n*, vol. xliii., July 2, 1904, No. 1.

The cases are summarized as follows:—

1. Four cases gave a family history of tuberculosis.

2. Five cases occurred in females whose ages ranged from seven to thirty-nine years, and one case in a male twenty-five years old.

3. In three cases two aspirations were made; in one case, three; in another, four; and, in another, ten.

5. The urine from four cases out of six gave a reaction for iodine the next day after the aspiration. This reaction persisted only for two or three days, except in one case in which it persisted for two weeks.

6. Slight mental depression was noticed in two cases.

7. As a general rule, there was an elevation of temperature from 2° to 4° following each aspiration.

8. The cultures were sterile in every case except one, in which the Bacillus Proteus vulgaris was obtained.

9. In all six cases there has been no indication of return of the abscess after a period of five years in one case, three years in another, and two years in a third, while in the remaining three one year or less has elapsed since the last aspiration. There was marked improvement in the general health of every patient.—*Robert B. Osgood, M.D., Boston, Mass.*

264. The Treatment of Tuberculous Spondylitis. By Dr. L. Wullstein. *Zeit. f. orth. Chir.*, xii. 4.

The work of Calot which appeared in 1897 has had the result that tuberculous spondylitis is treated absolutely conservatively only under definite indications.

This absolutely conservative treatment—*i.e.*, the recumbency bed—is used: first, in all patients who are still in their first year; second, in those in which there are demonstrable gravity-abscesses or other signs of active disease; and, third, where active signs appear after "trial extensions."

In patients in which there is no contra-indication to portative jackets we follow three methods: the first, in those in whom we aim only for a certain gradual straightening by slight simple extension, corresponding to the "trial extension" mentioned above; the second, for those in whom we wish to flatten out the gibbosity further than by mere extension,—namely, by "pad" pressure; and the third, where the chief therapeutic measure from the very beginning is a total lordosing of the back.

In every case he first applies plaster jackets and later removable apparatus. Moreover, in every case he believes it necessary to extend the spine equally from the occiput to the pelvis, except in atlanto-occipital disease, where a smaller plaster is permitted.

In the application the redression apparatus for scoliosis described and reported previously is used.

1. The simple extension jacket. A careful account of all the details of the technique, referring especially to the manner of padding.

After the patient is placed in the apparatus and correctly padded, extension is carried out very gradually. Besides the forehead and occiput, the chin is included. After the head and neck have been well encased, the pelvis is begun, and very gradual extension is continued both from below and above. Lastly, the upper and the lower halves are quickly connected, wooden or metal re-enforcements being incorporated.

In trimming, the chin is freed as well as the front of the neck.

After a time, if the case progresses favorably, the plaster is divided horizontally at the level of the gibbosity, the patient once more placed in the machine, and extended. The upper and lower parts are separated from 2 to 5 cm., and the gap closed with plaster bandages.

2. "Pad"-jacket. Used later in the course of the disease, after a certain amount of extension has been accomplished.

The patient is placed in the machine the day before and extended, and a plaster impression made of the knuckle, so that from the negative a positive "pad" is made. The pad is carefully cushioned with felt. The jacket is applied as before. By a double-screw arrangement the "pad"-holder is removed without damaging the jacket, the "pad" itself remaining inside.

3. The reclination jacket and the reclination corset. If by previous treatment the gibbosity has been flattened sufficiently or if the knuckle at the initial treatment is so slight that extension almost flattens it, we try to achieve a complete lordosis of the back.

For this purpose a jacket is constructed, the continuity of which is interrupted at the height of the kyphos. A wire netting is incorporated in the back of the jacket, acting as a hinge on which the upper half works on the lower. Two long bolts with threads running in opposite directions run into nuts fastened above and below. By turning the bolt one way, the nuts are approximated, thus increasing the reclination (hyperextension) of the patient, and *vice versa*.

A similar device is applicable in disease high up, even in the atlanto-occipital joint.

A corset made according to this scheme is also described. A head-piece can be applied to this, and no chin-piece is necessary, as the forehead is encased.

4. An adjustable reclination bed. This is a modified Lorenz reclination bed. It is divided at the height of the gibbosity, and the principles of the reclination jacket applied; *i.e.*, the wire netting and the bolt arrangement. The amount of lordosis may thus be regulated. In cases of contractures at the hips posterior leg splints may be fastened on.

5. The manner of obtaining the negative for the reclination corset, reclination cravatte, and reclination bed. The work is copiously illustrated.—*Henry O. Feiss, Cleveland, Ohio.*

265. The Relations between "Spondylitis Traumatica" and "Ankylosis of the Spinal Column." By Reuter. *Arch. f. Orthopaedie,* Bd. II. Heft 2.

Under the name of spondylitis traumatica, Reuter described a form of kyphosis which follows slight injuries to the spinal column. The clinical course of the disease is in all cases quite typical. The patient receives a slight injury to his back, which causes very little suffering, soon returns to his accustomed work, and only after weeks or months have passed does severe suffering call attention to a rounded kyphos, generally in the dorsal region. Bechterew's kyphosis and occupation kyphosis differ from the above, clinically, only in that there is no latent interval between the injury and the appearance of the kyphos. The pathology of spondylitis traumatica is quite unknown, the only theory being that of Kummell, who first described the pathological appearances of such a case as being a sort of bone atrophy, called by him "rarefying ostitis," or by v. Recklinghausen "traumatic osteomalicia." Reuter claims that the term "rarefying ostitis" does not rest upon the most secure pathological basis, as no microscopic evidence has been presented to show that the appearances were really caused by osteoklastic cells, and not the giant cells of tuberculosis. He undertakes to prove the incorrectness of Kummell's theory by making careful pathological examination, both gross and microscopic, of a number of cases which should correspond as closely as the material would allow to the three clinical stages into which spondylitis traumatica could be divided.

1. "The slight injury to the spinal column." As it is very evident that these conditions never lead to autopsy, the author dissects the apparently uninjured portions of the spinal column of cases which had met with more severe contusions to the spine. Here he finds countless small hemorrhages into the periosteum, injuries to and hemorrhage within the ligaments, minute fractures, and small areas of bone softening in almost all these portions of the lumbar and dorsal vertebræ which upon superficial macroscopic investigation seemed uninjured. These discoveries being almost constant in the cases investigated by Reuter and others, he concludes that these are the etiological factors which later on produce the rounded kyphosis.

2. "The interval free from all symptoms" the author takes to be the time in which the spine is repairing the damages done by these injuries. The damage done to the ligaments is either replaced by scar tissue or by bony outgrowth from the neighboring vertebræ. The intervertebral cartilage, when severely injured, does not regenerate, but disappears, and its place is taken by fibrous or bony tissue. After fracture of the vertebræ the callus formation is not very abundant, and bony union is long delayed. The force of gravity working upon an injured spine is resolved into two components, one of which tends to push the entire spine backward into the form of a long bowed curve. That there should be no subjective symptoms Reuter explains by the supposition that the elasticity of the uninjured ligaments, together with the active contraction of the muscles and their normal tone, for the time being equalizes the change in the static relations of the vertebral column, and only after the muscles are relaxed and over-stretched do the symptoms present themselves.

3. The stage of kyphosis. Careful examinations showed that in these cases there existed no sign of real inflammation of the vertebral column, but a simple ossification of the injured tissues.

It has long been held that Bechterew's kyphosis is an entirely different process from spondylitis traumatica, because in the former the spine cannot be straightened, while in the latter moderate force will cause the kyphosis to disappear. The author points out that this discrepancy is due to the fact that cases of Bechterew's kyphosis are only seen late in the course of the disease, while the cases of spondylitis traumatica are generally seen quite early. This apparent discrepancy disappears, if the cases under comparison be examined at approximately the same stages. The real clinical difference between the diseases is that in spondylitis traumatica there is an interval free from all symptoms between the trauma and the beginning kyphos. Both diseases are due in the first place to a trauma, a "contusion of the spine," and in a legal sense are to be regarded as accidental injuries, even if the patients do not complain of their symptoms until a long time afterward. The cause of both diseases will be found to be slight injuries to the ligaments, vertebræ, and intervertebral disks, which become ossified under abnormal static conditions; and Kummell is quite in the wrong for supposing a rarefying ostitis to account for the symptoms.—*Walter G. Stern, Cleveland, Ohio.*

BONES AND JOINTS.

266. Late Rickets. By Delcourt. *Jour. Méd. de Bruxelles*, 1899, No. 42.

Assumes the existence of a late rickets which develops at about the time of puberty. Etiological factors are acute infections, disturbances of nutrition, onanism, albuminuria, genital disturbances, and goitre. The pathological anatomy is the same as in the infantile form.

Late rickets may come on as acute general rickets with digestive disturbances and bone pains, or it may localize itself in certain parts of the skeleton in which it produces the characteristic changes. These are genu valgum and varum, scoliosis, coxa vara, pes valgus, and deformities of some of the other long bones. The similarity of the symptoms and the manner of development permit the conclusion that the pathogenesis is one and the same.—*Abst. Zeit. f. orth. Chir.*, xii. 4.

267. The Treatment of Chronic Arthritis by Injection of Vaseline. By Buedinger. *Wien. klin. Woch.*, No. 17.

Dr. Buedinger employs injection of vaseline in chronic arthritis, not of the tubercular or gonorrheal type, with good results. He uses 1-4 cm. of heated sterile yellow vaseline in the knee joint, 3 cm. in the shoulder joint, and 1-2 cm. in the smaller joints. Ordinarily, one-half to two hours after the injection, pain arises, lasting usually two to six days. Quite often also there is numbness. Generally, a slight inflammatory swelling of the affected joint, a sort of low-grade synovitis, takes place as well. His conclusions are that in slight chronic arthritis injection of vaseline gives usually a good result, sometimes an excellent one. In severe chronic arthritis it brings an evident improvement in many cases. And in old joint processes, which should be mobilized, it furnishes a useful adjunct to the other forms of therapy.—*David Townsend, Boston.*

268. The Serum Treatment of Acute Articular Rheumatism. By Schaefer, Pankow. *Therapie der Gegenwart*, Berlin, vol. xlv., No. 3.

Serum Treatment of Articular Rheumatism.—Schaefer treated six cases of articular rheumatism in adults and children with Menzer's anti-streptococcus serum, with the best results. The attacks were much shortened, and the health afterward usually good. No by-effects were noted.—*Abst. Jour. Am. Med. Ass'n, May* 14, 1904, *R. B. Osgood, Boston.*

269. A Simple System for the Ambulatory Treatment of Joint Contractures. By Dr. Eduard Weisz. *Zeit. f. orth. Chir.*, xii. 4.

For the resisting force, weights are used. With the aid of a sling, a cord, and a few pulleys, the pull can be exerted in any direction. Counter-pull consists in fixing that part of the body according to the joint under treatment. The apparatus is recommended for appropriate cases on account of its cheapness and simplicity.—*Henry O. Feiss, Cleveland, Ohio.*

270. After-treatment of Traumatic Joint Conditions. By Eduard Weisz. *Prag. med. Woch.*, No. 20.

The principal element in the after-treatment of traumatic joint conditions is cold and rest, to be applied only so long as absolutely necessary. As quickly as possible heat, in the different forms, and movement (massage, gymnastics, etc.) must be substituted.—*Jour. Abst. Deutsch. med. Woch., David Townsend, Boston.*

271. Arthropathy in Tabetics. By Dr. A. Blencke, Magdeburg. *Zeit. f. orth. Chir.*, xii. 4.

Review of history. Mitchell, not Charcot, the first one to show the relation of joint affections to tabes. The author reports the case of a man fifty years old, giving a history of lues and swelling in the knee joint for eleven years. In the last year and a half the thigh pushed forward beyond the lower leg, and later the swelling broke, the opening becoming larger and larger, until finally the internal condyle itself was exposed in its complete extent. It had broken through the skin, and the tibia had luxated far back. The leg was amputated, and the wound healed well.

Then follows an account of the occurrence and symptom complex of these joint affections in tabes. As to the origin, the theories take two directions. On the one hand, there are those who believe the arthropathic a trophic disturbance, based directly upon disease in the spinal cord; while the opponents blame the spinal affection only indirectly, and point before all else to the manifold disturbances from which such a joint suffers, referring to the ataxia, analgesia, and the like. On the one side are the neurologists, on the other the surgeons. The writer takes a middle view. Then follows an account of the therapy. A long list of references is appended (395 articles).—*Henry Feiss, Cleveland, Ohio.*

272. The Treatment of Joint Tuberculosis in Childhood. By Hoffa. *Archiv f. Orthopaedie, Mechanotherapie, und Unfallchirurgie,* Band II. Heft II.

The treatment of the tubercular arthritis of childhood must be conservative. If this be instituted early enough, mobility and function can be restored; yet ankylosis is to be expected in the majority of cases. While shortening is unavoidable, excessive contractions are due to faulty treatment. Duration of conservative treatment is two to three years. Supportive treatment with baths, arsenic, potassium iodide, cod liver oil, and inunctions of green soap, is advised. Local treatment consists of immobilization, extension, and injections of iodoform-glycerine emulsion. As soon as the pain subsides, ambulant treatment should be begun. Suppuration is no indication for extensive operation. Simple aspiration and injection of iodoform usually suffices. Certain cases will be benefited by Bier's congestive treatment. *Brisement forcé* is rarely indicated. Resections should be atypical and conservative, and amputation is only a method of last resort.—*Abst. Wuerzburger Abhandlungen,* Bd. III. Heft 12, *Walter G. Stern, Cleveland, Ohio.*

273. Multiple Loose Bodies in the Knee Joint. By John Prentiss Lord, M.D., Omaha. *Jour. Am. Med. Ass'n,* vol. xlii., No. 19, May 7, 1904, p. 1211.

The author reports the case of a man thirty-three years old from whose knee joint ten loose bodies were removed. As some of the most troublesome of these bodies were behind the condyles, the joint was laid freely open by sawing through the patella, dividing the crucial and lateral ligaments. A satisfactory end result after removal of all the bodies was obtained in this case. The writer, however, does not recommend this very radical operation in all cases, as it precludes the possibility of early post-operative manipulation, and the functional result must be always more or less imperfect.—*Robert B. Osgood, M.D., Boston.*

274. Concerning Bier's Congestion Treatment. By Luxembourg. *Muen. med. Woch.,* 1904, No. 10.

Report of experience with this method in the clinic of Bardenheuer. Their experience in a large number of tuberculous and gonorrheal joints was very favorable. They use very thin, translucent rubber bandages, and apply them twice daily, an hour each time. They note especially the preservation of motion in tuberculous cases which seemed adapted for conservative treatment, and as well the healing of very stubborn fistulæ after operative procedures. In gonorrheal joints it was gratifying to note the rapid relief of pain and the return of function.—*Abst. Centr. f. Chir.*, No. 21, 1904.

275. **Ankylosis of the Jaws.** By G. Lenox Curtis, M.D., New York. *Jour. Am. Med. Ass'n*, vol. xliii., July 2, 1904, No. 1, p. 22.

The author considers the chief irritating causes leading to inflammatory ankylosis as trouble with the teeth, traumatism, or any of the septic infections.

Permanent ankylosis, he states, is due to true osseous formation within the joint, and is rare except in rheumatoid disease.

He then reports several cases, and describes the apparatus and operative measures used to benefit the condition.—*Robert B. Osgood, M.D., Boston, Mass.*

276. **Radiographic Studies of the Functional Structure of the Spongiosa of the Calcaneum.** By Haglund.

The calcaneum was chosen for this study because its function is subjected to a great number of variations under normal and pathological conditions both in man and animals, and because its structure can be easily studied *in vivo* by means of the X-ray.

The advantages of the radiographic method are emphasized, and need not be recounted here.

Part two concerns the spongy structure of the human calcaneum in normal function. The author concludes that, if one wishes to find a relation between the spongiosa of the calcaneum and its mechanical function, it is necessary to regard it as an organ of locomotion, and not simply as the rear part of an arched vault which serves simply to support the body weight in the standing position. This is especially important for the reason that the act of locomotion makes tremendously greater demands upon the strength of the calcaneum than standing. The structural picture of the "functional plane" of the calcaneum is found to differ considerably from the previous descriptions and diagrams given for this bone by other authors.

In part three the spongy structure is studied under pathological function. The cases were either patients who had been subjected to Pirogoff amputations or extreme cases of pes equinus and equino-varus. In all of these cases, which were radiographed *in vivo*, the author found changes which must evidently be brought into relation with the altered function. This is especially to be remarked in the Pirogoff cases, where the disappearance or marked reduction of such bone trabeculæ as are evidently concerned with muscular activity is to be observed. The author has also been able to find these same changes in anatomical preparations of deformities in the museum of Upsala.

The fourth part of the work is devoted to the study of the calcanea of some mammals. A considerable difference is found between the spongiosa of the calcaneum of plantigrade and digitograde mammals, likewise between those moving slowly and rapidly. The calcaneum of those animals walking upon the os calcis, however, bears less resemblance to that of man than has previously been assumed. On the other hand, that of the chimpanzee has its spongiosa arranged singularly like that of man.

The author concludes that his work is an additional prop to the Wolff law of transformation and to the doctrine of functional accommodation as applied to all living matter. In this the results of this research are in agreement with the recent studies of Walkhoff on the arrangement of the spongiosa in other parts of the skeleton. The manifest differentiation of the various courses of trabeculæ in the calcaneum corresponding to various muscle functions corroborates also the conception of Wolff, according to which *intermittent* pressure is the factor in function which is of form-determining importance.

A bibliographic list of 74 items and a number of illustrations accompany the work.—*From the author's own review in Zeit. f. orth. Chir.*, xii. 4.

277. **The Structure of the Bone Spongiosa of the Upper Extremity.** By Buedinger. *Zeit. f. Heilk.*, 1902–03.

An extensive examination into the structure of the humerus, fore arm bones, and shoulder girdle. He concludes that it is necessary to examine a larger number of sections of each region than has been done. The general conclusion which is reached is that, while we can find evidence of the accommodation to function in the structure of certain parts, we have not yet progressed beyond the bounds of supposition regarding the general architectural plan of whole bones or even whole regions of the body.—*Abst. Zeit. f. orth. Chir.*, xii. 4.

278. **On the Filling of Bones.** By Dr. A. Bruenning, Giessen. *Deutsch. med. Woch.*, April 7, 1904.

Dr. Bruenning discusses the substitutes, such as decalcified animal bone, ivory, etc., the different authors have employed to take the place of diseased bone or bone which is absent. He speaks of the methods and substances that have been used for closing and filling up cavities in bones following osteomyelitis and other causes. Many of the substances are too inelastic, while the bone is elastic; and consequently a fracture of the bone may result. Celluloid, plaster of Paris, cement, living and dead bone, have been used. In 1901 Hackmann employed a mixture of spermaceti, sesame oil, and iodoform to fill bone cavities, the cavity being first treated aseptically. This method has the advantage of offering a sufficiently strong yet elastic material. Later Mosetig-Moorhof advocated that, before filling, the cavity should be thoroughly cleansed, all the diseased portion removed with a chisel, then thoroughly dried with hot air. In the clinic at Giessen the Mosetig-Moorhof method is followed, with the addition that, after the cavity has been cleaned, it is swabbed out with a 1 per cent. formalin solution and dried with hot air. Unfortunately, all cases are not suitable for this method; and wholly excluded are those cases where the cavity cannot be completely smoothed up and cleansed with a chisel or curette.—*David Townsend, Boston.*

279. **Acute Infectious Osteomyelitis and its Consequences.** By Trendel. *Beitraege zur klin. Chirurgie*, Tuebingen.

Trendel completes the statistics previously published from von Brun's clinic, classifying the material according to sex, age, occupation, etiology, localization, etc. The total is 1,110 affections of long bones and 169 of others. He also gives the direct and remote results.—*Abst. Jour. Am. Med. Ass'n*, vol. xlii., *June* 4, 1904, No. 23, *Robert B. Osgood, Boston.*

280. **Disturbances of Growth of the Bones in Tuberculous Arthritis.** By Genevrier. *Rev. Mens. des Mal. des Enf.*, 1903.

An investigation of the disturbances of growth in the neighboring long bones in cases of joint tuberculosis. He finds that growth is variously influenced.

1. The neighboring bones become longer or shorter than the fellow of the sound side. Shortening is more frequent. A period of lengthening may precede one of shortening. Lengthening occurs chiefly in young individuals shortly after the beginning of the affection. In those cases in which the author found femur and tibia lengthened, the foot was shortened. Shortening is apt to be greater than lengthening.
2. A number of trophic disturbances which modify the bone both in appearance and structure. The bone loses in volume, the density of the spongiosa is lessened, the marrow canal is relatively large, and the compact substance is thinned.

3. Changes in the size and shape of the neighboring epiphyses, consisting in increase of size and internal atrophy. This may result in deviation of the axis of the affected member.—*Abst. Zeit. f. orth. Chir.*, xii. 4.

281. **The Formation of Cartilage in the Repair of Fractures.** By Matsuoka. *Zeit. f. Chir.*, lxx. 1 & 2.

A research into the formation of cartilage in the healing of fractures. The experiments were made upon birds, and consisted of subcutaneous fractures of one or both of the fore arm bones or of the tibia. Part of them were treated with plaster bandages, part without any fixative appliance. The histological examination of the fracture was made 2–22 days after the injury, and showed that the formation of cartilage almost always occurred with the beginning of repair. It was always to be seen in the external periosteal callus, but not in particular places. Fixation by means of dressings always resulted in its earlier disappearance. When exact reposition and retention was secured, callus formation without a zone of cartilage was observed. Movement of the fragments seemed not to be a direct cause for the formation of cartilage. In cases where fixation was made either by means of newly formed callus or by means of dressings, sometimes large amounts of cartilage were formed.—*Abst. Zeit. f. orth. Chir.*, xii. 4.

HIP-CONGENITAL DISLOCATION.

282. **The Ultimate Results of the Bloodless Replacements of Congenitally Dislocated Hips.** By John Ridlon, M.D., Chicago. *Jour. Am. Med. Ass'n*, vol. xlii., April 16, 1904, No. 16.

The object of this paper of Dr. Ridlon is to present fairly the status of the bloodless reduction of congenital dislocations, and correct, as far as possible, popular delusion, largely due to sensational newspaper articles.

To Paci, of Pisa, is due the credit of first working out most that is essential in the operation recently credited to Lorenz.

Ridlon's cases are divided into four groups:—

1. Those seen by him in Chicago before his first bloodless replacement.
2. Those observed from his first bloodless operation in 1897 to the advent of Lorenz in October, 1902.
3. Those examined or operated upon by Lorenz, on which he has notes or has been able to obtain reliable information.
4. Those operated upon and examined by him since October, 1902.

In group 1 are included 10 cases, in none of which was any operation done. Two of the group have been traced: in one the functional result is good; the other refused operation for tenotomy of the flexors and abductors.

Group 2 includes 40 patients, with 51 dislocated hips.

Explanation of terms:—

A failure = where there has been neither an "apparent replacement" nor an anterior transposition.

Apparent replacement = the condition usually demonstrated as a perfect replacement by the operator.

Good result = anterior transposition.

Improved position = abduction accomplished and therefore the limb lengthened.

Perfect replacement = where the femoral head by careful examination, including skiagraphic, is in place at least six months after the removal of the splint.

A list of the possible serious accidents is also given.

In the second group of 51 hips, 24 were operated upon, 5 failures, 5 relapses, 1 supracotyloid displacement, 2 anterior transpositions, 2 perfect replacements, 9 apparent replacements.

The 40 cases are reported in detail with several skiagrams.

The article is concluded in vol. xlii., April 23, 1904, No. 17.

Group 3 includes the Lorenz cases, and is divided into three sub-groups. (*a*) 22 cases: 32 hips; 19 girls, 3 boys, which Lorenz from one cause or another refused to operate on.

(*b*) 22 cases: 26 hips operated on by Lorenz, 13 right, 13 left; 3 boys, 19 girls; ages, two to twelve years. Results: 12 anterior transpositions, 4 supracotyloid displacements, 7 failures, 1 apparent replacement, 2 perfect replacements. Accidents: 1 torn perineum, 1 paralysis, 1 fracture of neck of femur, 1 fracture of shaft of femur.

Ridlon concludes that, although he still believes this is the only operation in bilateral, and the best operation in unilateral, the general results will show about 10 per cent. perfectly stable anatomically perfect replacements, about 50 to 60 per cent. "good results," and 20 to 30 per cent. failures.

Group 4 includes those cases that have been under Ridlon's observation, and have been operated on by him since October, 1902. 43 patients; 53 hips, 25 right, 28 left; 3 boys, 40 girls; ages, seventeen months to thirteen years; one, twenty-one years old, rejected.

Results: 7 anterior transpositions, 4 supracotyloid replacements, 5 failures, 4 apparent replacements on removal of splint, 6 perfect replacements. 2 were rejected; 4 refused operations; 6 are waiting; 15 were apparently replaced at operation, and are still in splints.

Accidents: fracture of neck of femur in 2 girls of nine and ten years.

Of the grand total of all cases operated on there were 10 perfect replacements out of 94 operated upon.

The article, well illustrated by skiagrams, concludes with a consideration of the different phases of the operations and the treatment of the various accidents.—*Robert B. Osgood, M.D., Boston.*

283. Experiences with Congenital Dislocation of the Hip. By Horváth, Budapest. *Zeit. f. orth. Chir.*, xii. 4.

The author reports on 57 cases, 34 single and 23 double, in all 80 joints. Of these, 11 went away during treatment, 10 were not reducible, and in 9 there resulted a reluxation, and treatment was discontinued. In 14 cases there were anatomical cures; in 21, good functional results with transposition of the head forward. At present 15 are under treatment.

The writer believes that shortening of 8 cm. is beyond the limit for reposition. Even shortening of 5–7 cm. must require great care in reposition, watching for paresis and circulatory changes. In the bloodless reduction those cases are most favorable in which the shortening amounts to 3–4½ cm. An analysis of the cases follows. *H. O. Feiss, Cleveland, Ohio.*

284. The Bloodless Treatment of Congenital Dislocation of the Hip. By Lange. *Muench. med. Woch.*, No. 20.

Dr. Lange considers briefly the development of the bloodless treatment of congenital dislocation of the hip. He considers as well the symptoms, the hindrances to the reposition, method of treatment, etc. He describes the technique, and thinks between two to three years the best age to undertake the treatment. He sets ten years, in the single cases, although he has obtained a cure in a case of twelve years and another of thirteen years, and seven years, in the double cases, as the age limit. In 31 patients with 37 joints his results were 34 times a good functional cure, 16 times an anatomical cure, and 3 failures, in which no acetabulum was formed.—*David Townsend, Boston.*

285. Bloodless Treatment of Congenital Dislocation of the Hip. By Haudek. *Wien. med. Presse*, Nos. 16 & 17.

Haudek's experience of eleven cases speaks for the good of Lorenz's method. The reduction and the functional results are so much better the earlier the age at which the operation is undertaken. A true anatomical cure is obtained in only a moderate percentage of the cases; yet the anterior transposition of the head of the femur also gives very good functional results.—*Jour. Abst. Deutsch. med. Woch., D. Townsend, Boston.*

SHOULDER.

286. **Creaking of the Scapula.** By H. Kuettner, Tuebingen. *Deutsch. med. Woch.*, April 2–14, 1904.

Kuettner considers the etiology of the creaking of the scapula. It may be physiological, in which case a slight friction rub is perceived or movement of the scapula on the thorax. It may be pathological, when it is heard without any special manipulation of the scapula, and is perceptible to the patient and to those about him. It is to this type of cases that the name "creaking of the scapula" properly belongs. He divides the condition into three groups, those caused by

I. Abnormal bony projections on the ribs or scapula.
II. Changes in the muscular system of the scapula and thorax.
III. Bursæ between the thorax and scapula

Kuettner gives a series of 22 cases to illustrate these different groups, and describes the symptoms, diagnosis, treatment, and prognosis of the condition.—*David Townsend, Boston.*

287. **The Forward Position of the Shoulder Girdle as an Attitude Anomaly, and its Relation to "Round Shoulders."** By Dr. K. Hasebroek. *Zeit. f. orth. Chir.*, xii. 4.

There is one form of faulty position of children which consists in an abnormal position of the shoulder girdle. This condition has not been sufficiently distinguished from "round shoulders," although it is more frequent than the latter.

As is well known, true round shoulders is an increase in the normal kyphotic bend of the spine, the deformity being more marked because the increased roundness of the thorax causes the scapulæ to separate in addition. But the condition here discussed is a primary forward position of the shoulder girdle, with the articular processes of the scapulæ thrust forward and outward, and the angles raised.

We distinguish two kinds:—

1. The patient cannot correct himself, nor can he be passively corrected, owing to rigidity of the shoulder girdle.

2. The patient can be easily corrected passively, and can even correct himself for a short time. Anatomically, the condition depends upon resisting ligaments and musculature.

The ligaments in question are: first, the ligamentum costo-claviculare; and, second, the ligamentum coraco-claviculare.

In the muscles there is a change in the balance between synergistic and antagonistic ones. Either there is a primary contracture in the latter (pectorals) or a weakening of the former ones (rhomboids, trapezii, latissimus dorsi). The weight of the shoulder girdle would co-operate with the antagonistic muscles. Cases are described illustrating both phases.

The therapy depends on the underlying cause, and appropriate exercises are described. In certain cases, where the cause is weakness of the synergistic muscles, the author recommends a brace.—*Henry O. Feiss, Cleveland, Ohio.*

288. **A New Apparatus for Round Shoulders.** Dr. Schlee, Braunschweig. *Zeit. f. orth. Chir.*, xii. 4.

The construction and application are shown by two illustrations. The chief thing aimed at is that the pressure against the back is exerted at the very moment that the muscles suspend action, their work consisting in the raising of a weight. The patient by pulling up the weight stretches his arm-shoulder musculature; and, as the weight falls, the passive pressure is exerted on the kyphosis.—*Henry O. Feiss, Cleveland, Ohio.*

FOOT.

289. **Pes Planus.** By Dr. Hans Spitzy, Graz. *Zeit. f. orth. Chir.*, XII. Heft 4.

According to Lorenz and others, the foot of every new-born child is flat; but Dane demonstrated arching of the new-born foot, and the author says that only a heavy layer of fat can disguise the arch. 100 impressions were compared, and it was found that, the less the weight, the more perfect the impression of the arch. The tuberosity of the scaphoid never touched the underlying surface.

In 300 feet of sucklings in which the arch was obliterated by pressure the average perpendicular height of the tuberosity from the underlying surface was 12.5 mm. The tuberosity is situated low in the so-called congenital type. The space between the tuberosity and the underlying surface points, at least, to the existence of an arch (anatomical demonstration). Other demonstrations showed a definite relationship between the length of the foot and the height of the arch, in the new-born as well as in the adult. The author shows the changes in the development of the foot from birth to puberty, and maintains that he has disproved the statement so often made, "that the new-born foot is flat."—*Henry O. Feiss, Cleveland, Ohio.*

MISCELLANEOUS.

290. **Some Graphic Observations of Ankle Clonus.** By Augustus A. Eshner, M.D., Philadelphia. *Jour. Am. Med. Ass'n*, vol. xlii., May 7, 1904, No. 19.

The author first describes the phenomenon and considers its probable etiology. Records of the normal ankle clonus in healthy individuals are given. In these experiments the writer was the subject; and the kymographic record agrees with the figures of Alexander Gowers, showing between six and eight movements a second.

The results of experiments in various cases of hemiplegia, myelitis, compression myelitis, lateral sclerosis, and porencephaly, are given, with numerous kymographic records. The writer draws no definite conclusions from the method.—*Robert B. Osgood, M.D., Boston.*

291. **Gangrene and Contracture from Tight Bandaging.** By Kriege. *Archiv f. Orthopaedie, Mechanotherapie, und Unfallchirurgie*, Band II. Heft 1.

Kriege has gathered from the literature 23 cases of ischæmic muscular contracture. The majority of the patients were children. Tight bandaging after fracture or other injury is the chief cause: premonitory symptoms, severe pain, paresthesia, anæsthesia, cyanosis, swelling, and the formation of blebs.

Gangrene, on the other hand, occurs twice as often in adults as in children. Partial gangrene is really a decubitus from local pressure, and is often seen after the application of plaster-of-Paris casts. The premonitory symptoms of general gangrene are the same as those of ischæmic contracture.—*Abst. Vierteljahrsschr. f. gerichtl. Med. und oeffentl. Sanitaetswesen*, 3, *Folge* XXV., *Suppl. Heft, Walter G. Stern, Cleveland.*

292. On Congenital Flexion Contractures of the Hip and Knee. By Dr. Georg Schmidt, Breslau. *Zeit. f. orth. Chir.*, XII. Band, 4 Heft.

A review of the literature shows few reported cases, as the condition occurs very rarely. A case is here described which presented double congenital hip, knee, and foot contractures.

With reference to etiology, facts show that the deformities are intrauterine, as in the other reported cases. The deformities are therefore due to faulty positions in the uterus, so that there can be no organic changes in the musculature, but simply shortening. But such shortening does not exist merely in the muscles and tendons, but also in the skin and other soft parts. Treatment depends therefore upon mechanical means, at least until good operative measures have been found. For the knee operative measures have been tried. In the present case, besides mechanical treatment, the hamstrings were lengthened; but the result is unknown, as the patient died of an intercurrent affection.—*Henry O. Feiss, Cleveland, Ohio.*

293. A Case of Bilateral Symmetrical Giant Growth of the Extremities, the Shoulder and the Pelvic Girdle, in Connection with Cryptorchism. By Dr. W. Voltz, Cologne. *Zeit. f. orth. Chir.*, XII. Heft 4.

In this case the great growth began at the age of twenty-three. At the age of thirty-four growth had not stopped. The Roentgen pictures show characteristic changes about the epiphyses, designated by Klebs "ostitis vascularis," the name referring to a hyperplasia of the blood vessels near the ephiphyses. Relation of the condition to acromegaly is discussed.

In the literature 34 cases of giant growth are reported, 14 of which are acromegaly.—*Henry O. Feiss, Cleveland, Ohio.*

VOLUME II. OCTOBER, 1904. NUMBER 2.

The American Journal *of* Orthopedic Surgery

I.

ULTIMATE RESULTS OF MECHANICAL TREATMENT OF POTT'S DISEASE IN DISPENSARY PRACTICE.

HENRY LING TAYLOR, M.D., NEW YORK.

It is rather remarkable, considering the vast number of cases of Pott's disease that have been treated during a series of years in our public clinics, that no definite reports of the ultimate results in unselected cases appear to exist. It is certainly desirable that surgeons should have an exact idea of what is being accomplished in an affection upon which so much time, thought and effort are being expended.

At the start it must be confessed that the term "ultimate" in the title is not used in a strictly accurate sense, since most of these cases, as will be seen from the report, are still under treatment at the end of the term that has been somewhat arbitrarily chosen.

A similar investigation of results in private practice, reported to this Association two years ago, was based upon cases that had been observed and recorded, with patterns of the spinal deformity, for ten years or more. Forty cases were reported answering these requirements, all but one of which had been treated by the Taylor brace. The results, with the patterns' were published in our Transactions for 1902. The same requirements of observations with notes and patterns for ten years or more, were taken as a basis for investigation at the

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Presented at the Eighteenth Annual Meeting of the Association, Atlantic City, N. J., June 8–10, 1904.

clinic of the Hospital for Ruptured and Crippled, New York, where practically all the new cases of Pott's disease are recorded in detail. Owing to the fact that the notes after the first visit are few, only 11 cases were found answering these requirements, out of nearly 1200 cases recorded between 1888 and 1894. The periods covered by the notes and patterns in the 11 cases varied from ten to fourteen years. Every case was treated by mechanical support, and usually by fixed plaster-of-Paris jackets for from four to eight years, after which, if the patient was considered free from active disease, a laced plaster-of-Paris corset was usually substituted. In the upper dorsal and cervical regions a jury mast was added; in Cases 1 and 4 this addition to the jacket is noted. One case (3) was treated by the Taylor brace, and one (9) by the Knight brace throughout; in several the Knight brace was used in the later stages. The jackets were applied by the house staff, and varied somewhat with the changing personnel. They were changed every ten to twelve weeks, unless the patient absented himself contrary to orders. Patterns were taken with the lead tape and transferred directly to the pages of the histories by pencil in the usual way, the patient being in the prone position.

The 11 cases of this group varied from two to eight years of age; six were three years or under. In no case had the symptoms attracted attention for more than one year; in seven the duration was given as six months or under. In other words, these were young and beginning cases. In most instances the general condition when first observed was good or fair, and the deformity slight or moderate. Three had complicating bone disease, Case 2 in the radius and maxilla, Case 3 in the hip, and Case 6 in the knee. Two (8 and 10) had spinal abscesses, one of which receded without opening. In none was paraplegia noted.

In many instances the notes are defective as to the exact condition of the patient after the ten-year period; all but one or two were still under treatment and wearing support of some kind, either a plaster jacket, corset, or brace, at the time of the last note. Of the cases which had left off support, one

(8) relapsed after a fall; in two support was reapplied after a year or two owing to pains, and but one (11) was known to be cured, having been without support during eight years.

In every case but one (7) the final result showed a considerable increase in deformity; in Case 7, after an initial increase there was a final decrease and practical obliteration of all deformity.

In one or two instances a preliminary gain was followed by a marked increase later. The results as to deformity may be summarized as follows: Good, 1; fair, 5; poor, 5. The result in all cases but one was a marked kyphosis, and in about half the cases a large and disfiguring kyphosis.

The histories and tracings have been arranged as in the preceding study, in a series according to the location of the disease from above downward; the areas involved ranging from the fifth dorsal to the fourth lumbar.

This group of cases is far too small to be more than suggestive, nor is it perhaps quite fair as an indication of average results, for while the worst cases, those proving fatal within a few years, are excluded, so also are the best cases, cured within a few years, of which I have observed a considerable number, some with excellent results as to deformity. At the same time it bears out the writer's general impression that while the ordinary jacket treatment in dispensaries affords great relief and is productive of much benefit, it does not usually quickly arrest the disease nor prevent very serious and disfiguring deformity even in young patients seen in the first few months of the disease, and in otherwise good condition, and also that the results obtained are far inferior to them in private practice. But 1 of the 11 cases at the end of from ten to fourteen years' treatment could fairly be said to be cured, though all had been relieved, and the disease was quiescent in most.

The record and tracing of a case nineteen years old, which had never received any treatment, is added for comparison. The disease was of eleven years' standing, and was evidently cured, the general health was fairly good, apparently at least up to the average of the treated cases. The deformity was enormous, but not much greater than in several of the treated cases. She had never had an abscess or paralysis.

Case 1.—Fifth to seventh dorsal; three months' duration; considerable increase in deformity; still wearing brace.

Girl, seven years, came with marked angular deformity in April, 1892. There was also a slight inclination to the left. A plaster jacket with head spring was applied. The following July a right psoas contraction was noted. The head spring was worn three years, the jacket six years, when a Knight spinal support was substituted. At the last note, June 21, 1902, she was still wearing the brace.

Case 2.—Seventh and eight dorsal; three months' duration; large increase in deformity; disease quiescent.

Girl, three years, came with moderate angular deformity and in poor condition, in July, 1889. There were also two sinuses at the distal end of the radius. She wore a plaster jacket four years, and a plaster corset four or five years; since then an ordinary corset with extra stays. At the age of six she had an abscess in the maxillary region. At the time of the last note, October 24, 1903, the sinuses were all healed.

Case 3.—Seventh to ninth dorsal; two months' duration; right hip disease; large increase in deformity; still under treatment.

Boy of five, came in good condition, except for conjunctivitis, and with slight deformity, in April, 1892, and a Taylor brace was applied. In December, 1894, an abscess appeared on the inner side of left thigh, and he was found to have right hip disease. In October, 1903, he walked some and his tracing showed a large rounded bosse.

Case 4.—Eighth and ninth dorsal; four months' duration; considerable increase in deformity.

Boy, three, came with inclination to right, desire to lie down and moderate deformity, in January, 1891. His general condition was good.

A plaster jacket and head-spring were applied, and he wore them six years, changing them to a plaster corset and afterward to a brace which he wore about four years. For a year before the last note, October 21, 1902, he wore no support. At that time he came back complaining of pain in the side.

Case 5.—Eighth to eleventh dorsal; one year; considerable increase in deformity; still wearing brace.

Boy, eight, came in July, 1893, with considerable deformity, and in fair condition. He wore plaster jackets eight years, and afterward a Knigh tspinal brace, which he was still wearing at the time of the last note, August 29, 1903; the disease was quiescent.

Case 6.—Tenth dorsal; one year; moderate increase in deformity; disease quiescent.

Boy of three, came with marked deformity and a lateral inclination, but otherwise in good condition, in March, 1893. A year later he developed a tuberculosis of the left knee. He wore plaster jackets four years, and then plaster corsets, which he was still wearing on November 16, 1903, but there were no acute symptoms. His knee was still in a plaster splint.

Case 7.—Tenth to twelfth dorsal; one year; increase of deformity followed by marked recession; still wearing support.

Boy, three, with distinct kyphosis, right psoas contraction, and unable to walk, came in July, 1890. He wore plaster jackets with relief three or four years, afterward corsets, which he is still wearing. He was at time of last note, January 8, 1901, in fair condition, but complained of dyspnea, and was measured for a Knight spinal support. He has an hypertrophied and dilated heart. The deformity, which at first increased, has nearly disappeared.

Case 8.—Twelfth dorsal; three months; cure in four years with moderate increase in deformity. Recurrence (?) after a fall.

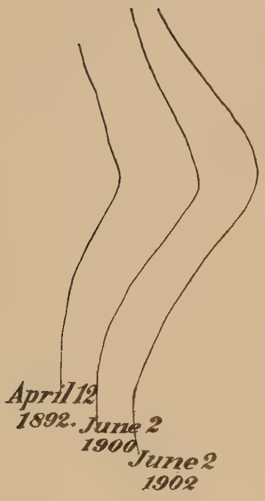
Girl, two and a half, came in good condition, with slight deformity, left psoas contraction, and a deep-seated psoas abscess, in November, 1892. She wore plaster jackets and corsets four years. She had no trouble for five years, but in August, 1901, she fell down stairs and since then has had pain in the right side and bends to the right. At time of examination and last note, January 2, 1902, a plaster corset was ordered. The abscess never opened.

Case 9.—Twelfth dorsal; one year; moderate increase in deformity; still wearing plaster corsets and in poor condition.

Boy, four and a half, came October 1, 1894, with marked prominence at twelfth dorsal, in good condition; some lateral bending. Wore plaster jackets eight years; last two years has worn plaster corsets. Is active but in poor general condition; does not hold himself well. Jacket ordered at mother's request.

Case 10.—Twelfth dorsal to second lumbar; six months; large increase in deformity; still under treatment.

Girl of two, came in January, 1893, with marked deformity. She wore plaster jackets about eight years. The last note, I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1900
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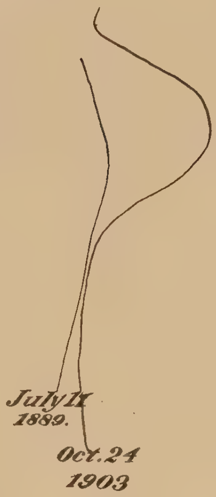
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1889.
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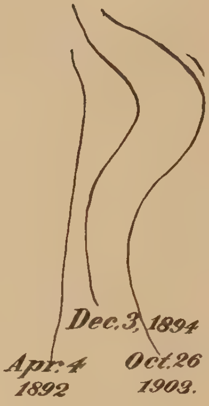
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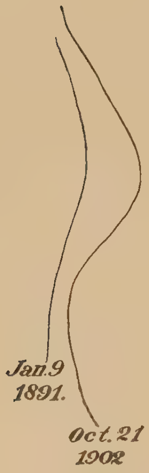
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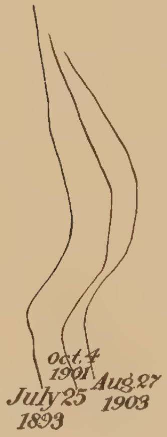
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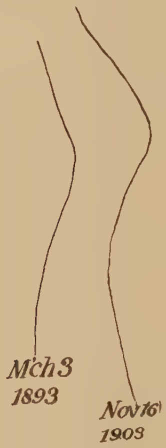
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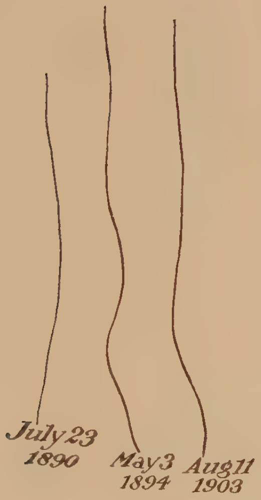
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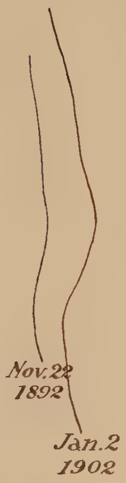
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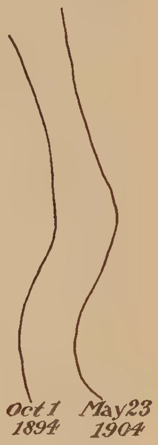
IX


Oct 1
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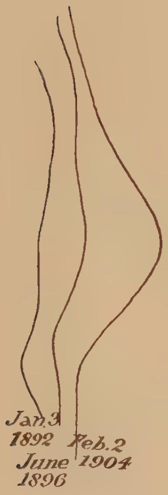
X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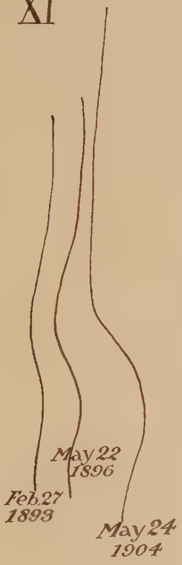
XI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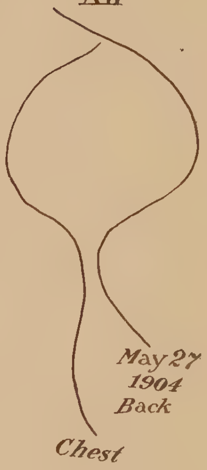
May 27
1904
Back
Chest

taken February 2, 1902, states that she was lost track of about three years, that she then had an abscess in the left iliac region, and a plaster jacket was ordered.

Case 11.—Fourth lumbar; six months; cure with Knight brace in three years. Later increase of deformity.

Boy, eight, came February, 1893, with moderate prominence at fourth lumbar; no pain. Six months later right psoas contraction. Wore Knight brace three years, and nothing since. May 24, 1904, general condition excellent; no appliance in eight years. Kyphosis has increased. No spinal symptoms.

Case 12.—Seventh to twelfth dorsal; never treated; enormous kyphosis and thoracic distortion.

Girl, nineteen, seen May, 1904. Disease began at eight years of age; never had any treatment for spine. The kyphosis, thoracic distortion and telescoping are enormous, and patient is much dwarfed in trunk. She never had paralysis or abscess. Her general condition is nevertheless fair, and she has no signs of active disease. Her standing height is 51½ inches, deducting shoes, her sitting height 23 inches, and measurement from anterior spine to malleolus 31 inches. The sternum is strongly arched forward, making an anterior kyphosis.

This untreated case is noted for comparison.

The mediocre results shown in this group of cases should stimulate us, possibly to a revision of the principles of treatment in Pott's disease, certainly to a more adequate technic in dispensary practice.

DISCUSSION.

Dr. Frieberg said that he wished to commend Dr. Taylor for his praiseworthy and conscientious investigations. Some of us do not realize one element which makes the deformity after the disease is cured. After Pott's disease there is a scar in the bone with a destruction of the center for growth activity. Do what we will, it is impossible to prevent the deformity due to failure of the bone to grow. It is scarcely possible to devise an apparatus which will prevent this. In a great many cases in which there is great destruction and necrosis, deformity is bound to occur.

Dr. Henry Ling Taylor said that he wished to emphasize the fact that he did not take a pessimistic view as regards Pott's disease in dispensary practice. He saw excellent results every day. One case which he saw was cured in three years and remained cured for ten years. There are many excellent results both with the cast and brace treatment. In the average case after treatment is instituted the acute symptoms are relieved and after a time the disease evidently becomes cured yet the deformity goes on increasing. It seemed to him that it is due the profession that we should acknowledge this and should try to make our methods and technic more efficient. The point to which Dr. Frieberg has drawn attention was quite carefully emphasized in a previous paper.

Dr. Frieberg said that he wished to say that he did not refer to static conditions. The nucleus of growth in the spine having been destroyed the vertebræ do not attain their full growth. It is a real destruction of the centers of bone growth.

Dr. Hoffa said that it was the same with all the other deformities. One must make an early diagnosis in order to get good results. When the bone is destroyed, especially when the epiphyseal lines are destroyed, the bones can no longer grow and you must as certainly have deformity as you do in hip disease. If the head of the femur is destroyed no treatment will obtain a perfect hip joint. There will be at least shortening of the leg, although the position may be good. It is the same with Pott's disease. If the bones are destroyed, if the centers of development have disappeared there must be a certain amount of deformity. By our appliances we must try to arrest the deformity as early as possible. The best means is to make very great hyperextension of the spine to reduce the deformity. With the best results there will still remain some deformity.

Dr. R. Tunstall Taylor referring to his work with the kyphotone, said that a report would soon be published and that the ultimate results would show somewhat better results than the series reported in the paper. Our chief point in the use of the kyphotone is to make pressure upon three fixed points in order to prevent an increase in the deformity. These are the sternum, anterior superior spines and the kyphos itself, against which pressure is made. The more pressure on the kyphos without injury to the skin, the better the result.

Dr. Henry Ling Taylor wished to say that most of these cases are beginning cases, two or three years of age. In these there is very little deformity. However, even in the young and even with the unfavorable conditions of dispensary practice we should do better than is actually being done in the institutions with which he was acquainted.

II.

A STUDY OF THE AMOUNT OF CORRECTION OF DEFORMITY IN POTT'S DISEASE OBTAINED WITHIN PLASTER JACKETS.

AUGUSTUS THORNDIKE, M.D., BOSTON, MASS.

Early last November the study of the amount of correction of deformity was undertaken at the Children's Hospital Outpatient Department, partly to determine which of the three methods of applying jackets gave the greatest correction and partly to obtain a more definite idea of what a jacket does accomplish. It seemed very desirable to make a tracing of the deformed spine within the hardened jacket as a test of its efficiency. Lovett did this two years ago by applying a thick plaster, and, after hardening, removing a strip one inch wide over the spines from top to bottom. Through this aperture a tracing is readily taken; but the jacket is much weakened, and consequently has to be very thick to prevent spreading and bending of the cut edges. It is possible, however, without materially weakening the jacket, to cut several openings or windows over the spines, leaving bridges of plaster between, and to take tracings through these apertures with the aid of this tracer, which was devised by Dr. E. W. Young, of Boston, in 1892, and which I have used ever since.

A broken series of lines representing parts of the curve are then obtained. They are transferred to cardboard, marked and cut out, the intervening parts are deeply notched to allow the pasteboard tracing to be tried on without striking on the plaster bridges separating the windows of the jacket. After fitting, the curve is completed by drawing the outline from this tracing on a sheet of paper and filling in the gaps by superimposing parts of the tracing taken before applying the jacket.

An opportunity soon offered to test the accuracy of the curve

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Presented by invitation at the eighteenth annual meeting of the Association at Atlantic City, N.J., June 8-10, 1904.

so constructed. A jacket was removed because unsatisfactory immediately after the tracing had been made. Another was applied, and I made the windows at the levels where the bridges of plaster had been left in the first. The two completed curves were exactly alike, and by superimposing the two cardboard tracings the same complete curve was reproduced. After repeating this experiment on another child, I was confident that tracings so constructed accurately represent the spinal curve.

Such tracings can be easily made in the erect as well as the recumbent positions, thus demonstrating changes in the curve from weight-bearing. Furthermore, tracings can be made just before applying the jacket, when the child is in position to receive one; and this can also be compared with the final tracings taken in the jacket. It seemed as if this method might be susceptible of giving varying results in the hands of different observers. Many of the jackets have been applied, and the tracings taken by Dr. George E. Chamberlain, of Boston, Dr. Frank W. Snow, of Newburyport, and myself, so that this work has been in the hands of three different observers; and I desire to give them due credit for an important share of the results. I also wish to have this communication regarded as a preliminary report, as six months is too short a period in which to obtain satisfactory consecutive tracings, as many plaster jackets are worn for longer periods without changing.

The methods of applying jackets have been three in number, all using the recumbent position: the so-called "hammock," in which the child lies prone on a cloth stretched on a frame; the method Goldthwait described in 1898, in which the patient lies on his back, the spine supported on two malleable steel rods generously padded with felt; and the method Lovett described in 1902, where the patient lies prone while the jacket is applied from the bottom to point of deformity, and, after hardening, the position is still further corrected by raising the front part of the frame while the kyphos is held down by a strap during the completion of the jacket.

No pull for extension has been employed, nor has anæsthesia; and in no case has force greater than the weight of the child been applied to the deformity. In fact, no forcible correction has been employed.

In order to obtain a series of spinal cases which can be compared, it is necessary to limit the mechanical problem by selection; and the following cases have been ruled out: (1) cases wearing or needing head-supports; (2) cases with inappreciable or slight deformity; (3) cases where the deformity is old and fixed, and ankylosis may be present; (4) babies and young children who wriggle and cannot have satisfactory tracings made. It includes children with all lumbar and dorsal caries below the sixth dorsal vertebra with well-marked deformity, capable of having satisfactory tracings made.

Fourteen jackets were applied on nine children in the hammock, eight jackets on seven children in the Goldthwait frame, and ten jackets on seven children in the Lovett frame. Patients were seen at frequent intervals, but jackets were kept on as long as they appeared efficient.

The immediate straightening was studied by comparing the tracing of the back lying prone with and without the jacket. By drawing a line connecting the first dorsal and sacrum, and measuring the distance of the most prominent part of the kyphos from this line, the following results were obtained:—

TABLE I.

In Inches at Kyphos.

Hammock	0, $\frac{1}{8}$, 0, $\frac{5}{8}$, $\frac{3}{8}$, $\frac{1}{8}$, $\frac{4}{8}$, $\frac{1}{4}$	advance or decrease of deformity
Goldthwait. . . .	$1\frac{1}{2}$, $\frac{7}{8}$, $\frac{5}{8}$, $\frac{5}{8}$, $1\frac{1}{2}$, $1\frac{1}{5}$	advance or decrease of deformity
Lovett	$\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{1}{4}$	
Dropped Ham . .	$\frac{1}{4}$, $\frac{3}{4}$, $1\frac{1}{4}$, $\frac{3}{4}$	

In Inches at Lordosis.

	Straighter.	More Curved.	
Hammock	$\frac{1}{8}$	0, $\frac{3}{8}$, $\frac{1}{4}$, $\frac{3}{4}$, $\frac{1}{2}$, $\frac{1}{8}$	increase of curve $\frac{3}{8}$
Goldthwait	$\frac{3}{4}$	$\frac{1}{2}$, $\frac{1}{2}$, $\frac{1}{4}$, $1\frac{1}{8}$	increase $\frac{5}{8}$
Lovett	$\frac{1}{2}$, $\frac{3}{8}$	$\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{8}$, $\frac{1}{8}$, $\frac{1}{2}$, $\frac{1}{2}$, $\frac{1}{8}$, $\frac{1}{8}$	increase $\frac{3}{10}$
Dropped Ham	0	$\frac{1}{8}$, $\frac{7}{8}$, $\frac{3}{4}$	increase $\frac{5}{8}$

On the hammock the deformity was straightened on an average of $\frac{4}{10}$ inch; on the Goldthwait frame, $1\frac{1}{8}$ inches; on the Lovett frame, $\frac{1}{4}$ inch. Lordosis was usually increased, but there were scattered cases where a straightening occurred. Two hammock cases showed no gain or loss. No case lost; yet I suspected that such might be the case, and determined to measure the angle of the kyphos before and after jacketing. A simple device, consisting of two sheets of note paper, held together by an ordinary eyelet, so as to allow motion around a fixed point, served for the purpose of reading the angle in degrees from the tracing. The following tables give the results:—

TABLE II.

HAMMOCK.

(*Kyphos in degrees.*)

	Without.	With.	Straighter.	Crookeder.
Agnes Moynihan	133	143	10	
Agnes Moynihan	136	152	16	
Lilian Lincoln	169	171	2	
Phil. Subori	138	138	0	
Helen Pope	153	151	—	2
Helen Pope	151	146	—	5
Helen Pope	143	154	11	
Helen Pope	144	156	12	
Ida Denalli	142	162	20	
Alice Broderick	144	164	20	
Ruth Bennett	145	165	20	
James Fontes	140	165	25	
Mary Barnes	110	135	25	
Mary Barnes	120	135	15	
GOLDTHWAIT FRAME.				
John Dudley	142	171	29	
John Dudley	145	170	25	
Mary Barnes	120	130	10	
Harry Gorrelli	140	150	10	
Barbara Lavery	150	163	13	
John Graconizzi	132	152	20	
Ruth Bennett	150	160	10	
Cæsar Sousa	155	160	5	
LOVETT FRAME (Kyphos).				
Janet Price	130	152	22	
John McSweeney	150	156	6	
Barbara Lavery	145	150	5	
Barbara Lavery	148	145	—	3
Mary Foley	90	94	4	
Gertrude Farley	160	180	20	
Gertrude Farley	168	180	12	
Cæsar Sousa	148	162	14	
J. Fontes	147	151	5	

The fifteen hammock jackets showed an improvement in the kyphotic angle in twelve, no change in one, and a slight increase in two, which was less than 5°. The average gain was 16°, the smallest being 2°, the greatest 25°.

The eight jackets applied on Goldthwait frame were all straightened: the average, 15°; the greatest straightening, 29°; the smallest, 10°.

The nine jackets applied on the Lovett frame showed a straightening of the kyphotic angle in all but one, where it was increased 3°. The average gain was 11°; the smallest, 4°; and the largest, 22°.

There were four jackets out of thirty-two which failed to straighten the kyphotic angle, three on the hammock and one on the Lovett frame; yet the hammock gave the greatest average gain in straightening the kyphotic angle. It therefore seems illogical to attempt to decide from these meagre statistics which method gives the greatest correction.

TABLE III.

Hammock. Test of Immediate Efficiency of Jacket.

	Lying.	Standing.	Loss.	Gain.
Alice Broderick	170	174		4
Helen Pope	154	142	12	
Helen Pope	160	155	5	
Phil. Subori	140	140		
Ruth Barnes	160	172	—	2
Alice Broderick	165	170	—	5
Ida Denalli	162	162		

Goldthwait Frame. Test of Immediate Efficiency to support in Jacket.

	Lying.	Standing.	Loss.	Gain.
John Graconizzi	152	150	2	
Ruth Bennett	163	163		
Cæsar Sousa	160	160		
Henry Correlli	160	160		
Julia Dudley	171	175	—	5
Julia Dudley	171	171		

Lovett Frame. Test of Immediate Efficiency in Jacket.

	Lying.	Standing.	Loss.	Gain.
James Fontes	152	157	—	5
Cæsar Sousa	160	163	—	3
Barbara Lavery	150	142	8	
Barbara Lavery	152	172	—	20
Gertrude Farley	180	178	2	
Gertrude Farley	180	177	3	
Mary Foley	94	100	—	6

An attempt was made in some of the cases to ascertain the supporting effect of the jacket by a comparison of jacket tracings standing and recumbent. The following results speak for themselves:—

Of seven hammock jackets three were from 4° to 12° straighter, two were not affected, two showed greater deformity, 5°-12°.

Of six jackets applied on the Goldthwait frame one was 5° straighter standing, and one 2° worse: the remaining four were unaffected.

Of seven jackets applied by the Lovett method four straightened in standing 5°, 3°, 20°, and 6° respectively, and three were shown to become more deformed by 8°, 2°, and 3°. The effectiveness of any support for caries of the spine depends upon maintaining the kyphotic angle in a rigid position, or, what is the same thing, preventing motion and pressure between the diseased bodies of the vertebræ. A few degrees of change from the difference in position it may be impossible to prevent; but, if we analyze the cases, it is at once seen that every one who exhibited more than 5° of change in the kyphotic angle on standing (whether it were a straightening or not) was improperly supported, and showed it by increased sensitiveness, pain, night cries, unwillingness to walk, psoas contraction or abscess, marked increase of the kyphosis. In fact, they represent all of the children whose jackets were changed in a week or two.

Further study is needed, not only to learn more of the changes of the curves under weight-bearing, but for the more practical test of the efficiency of our jackets. I am applying the test of these tracings to all our plaster jackets in the hope of arresting or correcting the deformity better.

One further test can be made with advantage when the child reports from time to time for observation. The cardboard jacket tracings are tried on at each visit without disturbing either jacket or the child; and, if they do not fit exactly, new spinal tracings are made, curves completed and compared with the original, when it is readily seen if the support is no longer good.

So far I have failed to discover more than 2° of change in the kyphotic angle even after wearing the jacket six and seven months.

Conclusion.—This method of study has been used too short a time to secure statistics, but seems to offer a test of the efficiency of the support and to prevent the prolonged use of an inefficient jacket under the delusion that it is giving support.

III.

THE TREATMENT OF UPPER DORSAL POTT'S DISEASE.

JAMES K. YOUNG, M.D., PHILADELPHIA.

The difficulty of preventing complications in the upper dorsal and cervical regions in Pott's disease is well recognized by all surgeons. The principal cause of the difficulty is the motion of the neck and the ribs, and of the upper extremities. Paraplegia in this region is very frequent and difficult to overcome because the patient is compelled to sit. The importance of fixation has long been recognized but the great problem which confronts surgeons has been how to accomplish this. In reviewing the appliances which have been used in the treatment of this disease most of them will be found to have independent head-pieces the objection to which is that they either allow motion or that they are removed by the patient.

The best manner in which to treat deformity of this kind is to use some fixation apparatus which will control absolutely the motions of the neck, ribs, and upper extremities as well as the trunk muscles. The occurrence of paraplegia, breath catch, or increased deformity would be an indication for recumbency.

Description of Apparatus.

The apparatus which is here recommended is made over a cast which includes the head, neck, and trunk. The patient is placed face down upon a frame, stockinette is securely applied to all these parts, and a plaster-of-Paris cast is made. From this an exact counter-cast is made and from the counter-cast a felt of celluloid cuirass is constructed. The head portion is made removable from the body portion, but the entire cuirass is secured and reinforced by steel. The cuirass is secured to

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Presented at the Eighteenth Annual Meeting of the Association, Atlantic City, N. J., June 8–10, 1904.

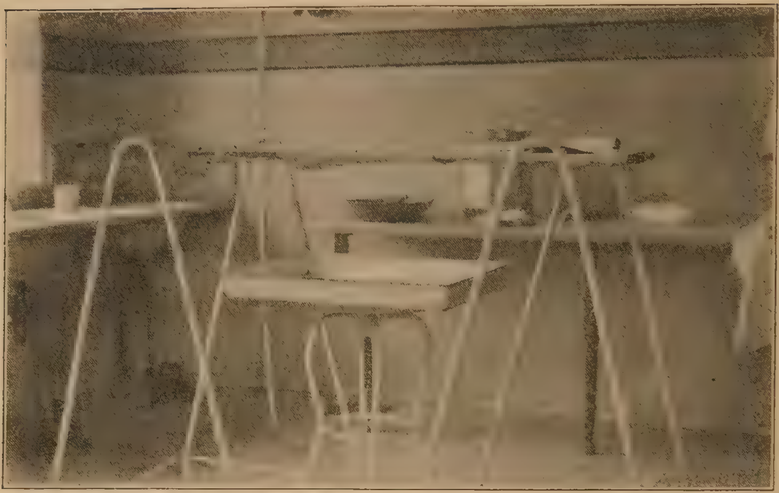

FIG. 1.—AUTHOR'S METHOD OF MAKING CAST FOR FELT JACKET. SHOWING FRAME.

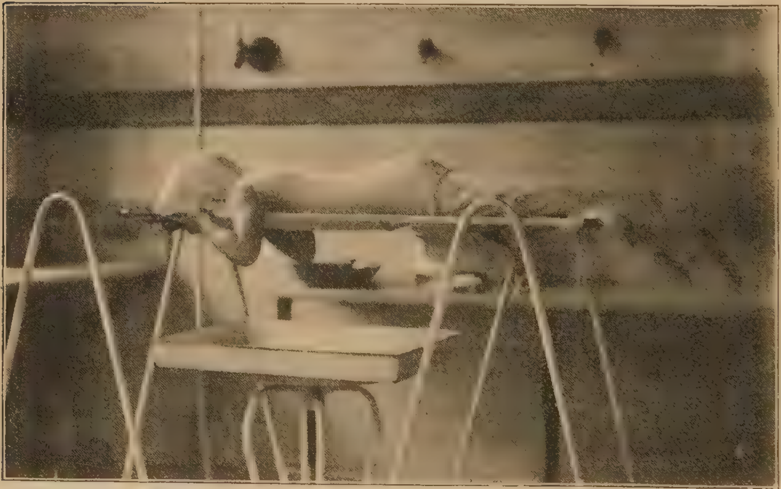

FIG. 2.—AUTHOR'S METHOD OF MAKING CAST FOR FELT JACKET. SHOWING PATIENT IN POSITION WITH STOCKINETTE APPLIED.

the body by broad webbing into which elastic webbing has been incorporated, and shoulder straps and a frontal band complete the outfit. It is applied with the patient lying upon the face and secured in position before the patient is turned over.

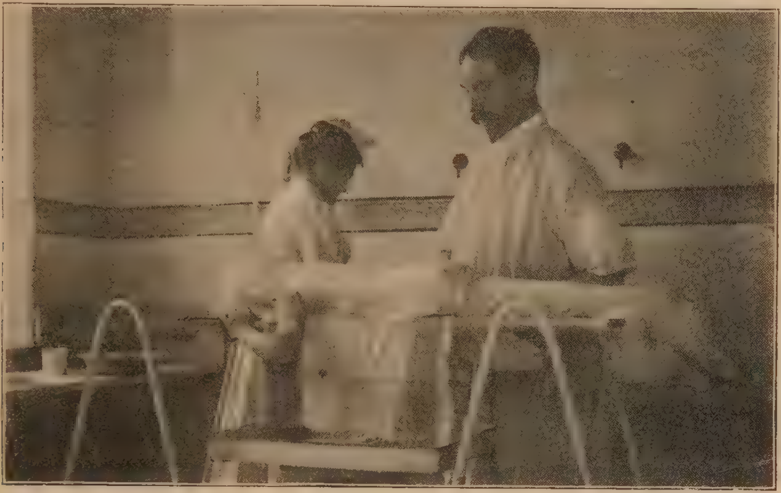

Fig. 3.—Author's Method of Making Cast for Felt Jacket. Showing Plaster Mould Applied.

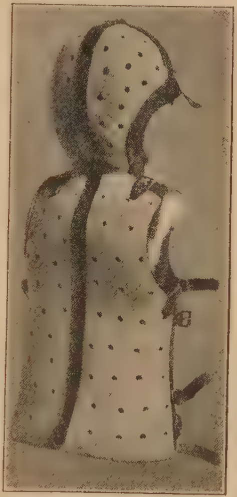

Fig. 4.—The Felt Jacket.

Bed Extension.

While the cuirass is being prepared or if any indications occur for recumbency the patient is placed in bed upon a wire frame bent backward, felt pads are placed under the deformity on either side, and the patient is secured to the frame immovably. By means of a specially constructed wheel couch the patient can be taken into the open air daily. This couch permits the patient to lie in the full extension position.

Results of Treatment.

The advantages of complete fixation are demonstrated in the results of this form of treatment. The deformity is reduced, the paralysis quickly disappears, and there is a complete restoration of function.

Illustrative Cases.

Case 1.—J. F., a girl, aged four, consulted me March 2, 1903. The family history was unimportant. The patient had had a fall in the spring of 1902 to which the mother attributed the trouble. During the summer of 1902 she had suffered from anorexia. Examination at the time of the first consultation showed weakness of limbs, and she stumbled in walking. A slight kyphosis of the mid-dorsal region was present involving the fifth, sixth, and seventh dorsal vertebræ. She wore a brace extending up to, but not beyond the seat of, the deformity. Patella reflexes were increased. There was no ancleclonus. Pott's disease with paraplegia was diagnosed. Attending physician had ordered gymnastic exercises.

On March 14, 1903, she was put upon a canvas frame in the recumbent position, and on April 2, a steel fixation brace was applied, which was not satisfactory, and after the application of which she grew steadily worse. On July 28 the first cuirass was applied. December 24 a new cuirass with adjustable head-piece was applied.

On January 13, 1904, she was reported as having been lying down for nearly a month on a bent frame with pressure pads. Temperature normal, and limbs about the same.

At this time Donovan's solution was prescribed, one drop three times a day for one week, alternating with iodide of potassium, three grains three times a day, for one week. This dose was gradually increased until she took four drops of the Donovan solution three times a day alternating with the iodide of potassium, eight grains three times a day. The dose was then gradually reduced and was stopped altogether on May 19, when cod liver oil was substituted.

On January 16, 1904, she could move in all directions with more agility than before, and where she had formerly complained of the old brace causing pain in the back, she did not complain of the new brace. Reported still well nourished and plump. (K. I.), sleeping well, and eating capriciously.

January 23, 1904. Right foot not as good as left. Appetite the same. Could flex and extend limbs.

February 27, 1904. Limbs were not stiff in the morning.

March 26, 1904. Reported as having had but one spasm, in right foot only, March 23, and for one moment only. Had sat up to eat only four times since Christmas.

April 1, 1904. Condition excellent. Could stand for five minutes without spasm. Ordered to wait one month before attempting to walk. Weight very much increased.

May 19, 1904. Patient walked two squares to my office. No ancleclonus. Patella reflexes normal. Walked well.

During the progress of the disease the temperature ranged from 98$\frac{1}{5}$ to 99$\frac{4}{5}$ except on May 12, 1904, when it reached 100$\frac{1}{5}$ at which time she had a slight gastritis.

CASE 2.—E. G., boy, aged —, consulted me March 6, 1902, suffering from Pott's disease, involving the sixth and seventh cervical and first dorsal vertebræ. Upon examination there was found priaprism, tetanoid paraplegia, sensation retained. Patella reflexes were lost and ancleclonus marked. There was present irritation pressure cough. There was complete paralysis of the lower and partial paralysis of the upper extremities. This paralysis was of three months' duration. A fatal prognosis had been given by one orthopedic surgeon and two general practitioners. The child was eating and sleeping well. The disease dated from August, 1899, and the mother gave the following history of the treatment to time of consultation with me. The patient was taken to the hospital November 26, 1899, where he remained until January 18, 1900. Plaster jackets were applied January 18, May 10 (head-piece also on May 10), and in December, 1900, and again in February and May, 1901. In August, 1901, it was noticed that he walked very badly as if the knee joints were stiff. He complained of his back, and of pains in his arms during August. Until he was extended in September he was wheeled in a go-cart and kept off his feet as much as possible. From September 17 to December, 1901, he was extended in bed. From this time until coming to me he had had no support. After he was first allowed to be out of bed he crept around on the floor, but from December 23, 1901, he gradually lost motor

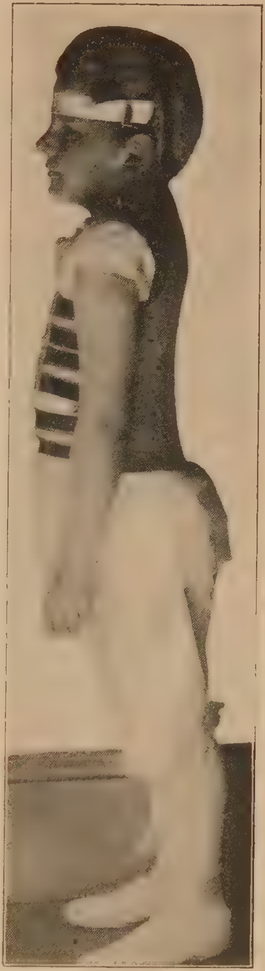

FIG. 5.—THE FELT JACKET APPLIED.

power until February 1, 1902, when it was found that he could not move his limbs up and down.

March 15, 1902, had cast taken, and on March 20 applied cuirass.

May 3, 1902. Fever 103$\frac{3}{5}$ until the 8th. Herpes on lips; probably dietetic.

May 7, 1902. Moved limbs.

September 25, 1902. New cast taken, and September 27, 1902, new cuirass applied.

December 3, 1902. The following notes of the case given me by the mother: Hot and cold applications until July 1, 1902. Was carried out on the porch every clear day. Commenced to stand up holding on to porch rail toward the latter part of June. July 1 went to Seashore Home at Atlantic City. Was creeping and using rolling chair but not allowed to walk. Left Seashore Home July 25, but remained in Atlantic City, and after this time walked about the house but used a go-cart when out of doors. Returned to Philadelphia, August, 16, 1902, still improving, able to dress himself and to run around.

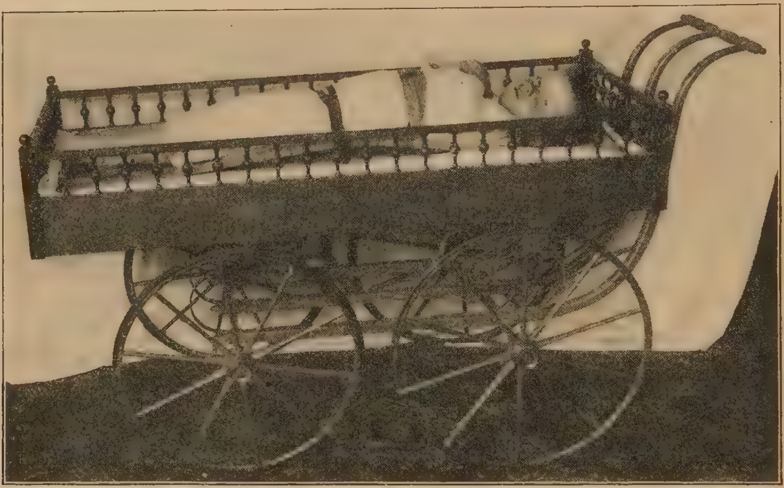

Fig. 6.—Author's Wheel Couch with Bent Frame.

July 11, 1903. New cast taken, and July 22 new cuirass applied.

May 10, 1904. New cast taken, and new cuirass applied June 1, 1904.

DISCUSSION.

Dr. Frieberg said that the apparatus was a very efficient one and almost exactly like a form of apparatus which has been used for several years by Dalinger in the west.

Dr. Blanchard said that the apparatus accomplished the same thing as a brace which he had presented several years ago. The objection is that the strap will be slipped off of the forehead. The strap must be passed from the temples under the chin.

Dr. Henry Ling Taylor said that the essential thing was the forehead strap. This has been used for twenty-five years or more in certain cases. At times it presents advantages, but the old plan of going up with the molded steel bar and curving it at right angles and bringing over the point seems quite as satisfactory, or more so. Chin support answers in most cases and the main point is to get the proper equilibrium, that is, bring the head far enough back. There is a real objection to the chin ring in the recession of the chin in certain cases. Recently he had a case where this recession, which, however, was from a jury mast, was at least three-fourths of an inch. He has had difficulty with the slipping of the strap. The chin has come forward since the pressure has been relieved. It is very important to bear in mind in certain cases that the support should come from the forehead instead of the chin.

Dr. Young said, in closing the discussion, that in presenting the cuirass and the patient he felt that it fulfilled the correct form of treatment in certain cases. There would be only 2 or 3 cases out of 200 or 300 that would require such treatment. In such cases absolute fixation is necessary to obtain a good result, and when absolute firm fixation is required this is a good means.

IV.

ANALYSIS OF ONE THOUSAND CASES OF STATIC FOOT TROUBLE.

W. E. BLODGETT, M.D., OF DETROIT.

The object of this investigation was: (1) to contribute to the sum of available statistics of static foot trouble; (2) to draw from the cases any warrantable conclusions.

The cases are from the Orthopedic Out-patient Department of the Carney Hospital, Boston, through the courtesy of Dr. Painter, and include only those cases of foot trouble in which the chief factor appears to be static; *i.e.*, an error of weight-bearing. Thus acute and chronic arthritis of the foot, paralytic, circulatory, and recent traumatic and inflammatory conditions, are excluded; but those cases are included in which any of the preceding causes determined a faulty static condition which itself had become the chief factor in the foot trouble. The data are from the hospital records and from the replies of 44 and the special visits of 125 patients in response to 600 postals. The cases are the thousand next preceding Sept. 1, 1903, and cover a period of two years and four months.

Sex. Relation to Total Orthopedic Cases.

	Static Foot Cases.	All Orthopedic Cases in Same Period.	Percentage Static Foot Cases to all Cases.
Male	426	1162	36.7
Female	574	1290	44.5
Totals	1,000	2,452	40.8

The female cases were in moderate excess, and the percentage of female cases to all the orthopedic female cases was slightly

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Presented by invitation at the eighteenth annual meeting of the Association at Atlantic City, N.J., June 8-10, 1904.

larger than the corresponding male percentage. The static foot cases were about two-fifths of the total orthopedic cases in the same period.

AGE.

(*Under 12 years not treated.*)

		Percentage.
12–19 years	166	17.0
20–29 "	260	26.6
30–39 "	234	24.1
40–49 "	181	18.6
50–59 "	96	9.9
60–69 "	35	3.6
70–79 "	2	0.2
	974	100.0
Unrecorded	26	

Two-thirds of the cases were under forty years of age.

TIME OF YEAR.

	Static Foot Cases.	Total Orthopedic Cases.	Percentage Static Foot Cases to Total Orthopedic.
May, 1901	31	95	32.6
June 1–Sept. 1, 1901	109	216	50.5
Sept. 1–Dec. 1, 1901	52	144	36.1
Dec. 1, 1901–March 1, 1902	73	174	42.0
March 1–June 1, 1902	128	305	42.0
June 1–Sept. 1, 1902	129	332	38.9
Sept. 1–Dec. 1, 1902	78	215	36.3
Dec. 1, 1902–March 1, 1903	93	240	38.8
March 1–June 1, 1903	144	387	37.2
June 1–Sept. 1, 1903	163	438	37.2
	1,000	2,546*	

The seasons of the year in order of the frequency of application during them of static foot cases, the season of greatest frequency being first, are summer, spring, winter, fall. There were entered in the summer on the average nearly twice as many cases as in the fall. The total attendance of all new orthopedic cases, however, shows much the same seasonal fluctuation.

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*Including 94 orthopedic cases with diagnosis unknown. In figuring the percentage to total orthopedic cases in a previous table, these cases were excluded, as some of them were probably static foot cases.

OCCUPATION.

		Percentage.
Housework (wife)	176	23.6
Housework or cooking (hired)	89	12.0
Clerk	36	4.8
Mill or factory	34	4.6
Laborer	32	4.3
Railroad	28	3.8
Waiter	24	3.2
Unclassified, requiring standing, as washerwoman, barber, bartender, etc.	147	19.7
Unclassified, not requiring standing	179	24.0
	745	100.0
Occupation unrecorded	255	

The relation of occupation to static foot trouble is illustrated by the following. Of 14 surface-car motormen with static foot trouble, 7 had symptoms in only the left foot (the foot supporting the body weight, the right being used to operate bell and brake), 2 had symptoms in both feet, but worse in the left, 4 had symptoms in both feet equally, and only 1 had symptoms in the right foot only, and in this case the left was objectively the worse. The weight-bearing foot therefore was affected alone in half the cases, whereas the free foot was affected alone in only one case, and in this case the weight-bearing foot appeared objectively the worse.

ÆTIOLOGY.

Trauma	85
"Acute rheumatism" or other arthritis, including gonorrhœa	38
Excessive weight (over 180 lbs.) or sudden increment of weight, as at the menopause	22
Illness just preceding onset of symptoms	22
Post-partum	12
Congenital; *i.e.*, said to have existed since birth and presenting, though at an early age, a foot completely flat with scaphoid dislocation	6

These figures understate the absolute frequency of operation of the respective causes in the thousand cases, because often no record was made; but they may be regarded as representing the relative frequency of the causes tabulated. Cases of foot trouble in which the present general condition or non-static local condition appears to be the more important factor are, as stated above, not included in the thousand cases, thus explaining the absence of present frank polyarthritis in a review of the causes of these cases. Certain conditions, local and general, though perhaps not direct causes, have been noted as predisposing or contributing to the weight-bearing error and to the liability to symptoms therefrom. Local: (1) long, slender foot; (2) hallux valgus. General: (1) mild, fleeting polyarthritic symptoms, probably toxæmic; (2) depression of physical vigor, without local symptoms except in feet, as shown by soft muscles, pale skin and mucous membranes, excessive complaining without effort at self-help, and general indolence of body and mind.

The commonest direct cause was trauma. (It may be questioned whether the trauma—for instance, a sprain—was not sometimes, rather than the cause, more the result of a static error already existent.) In many cases no satisfactory cause was found.

Right, Left, or Both.

		Percentage.
Right only	140	14.9
Left only	152	16.2
One side only (not specified)	28	3.0
Both	618	65.9
	938	100.0
Unrecorded	62	

In about two-thirds of the cases, therefore, both feet gave symptoms, though often not beginning at the same time. In the remaining cases the symptoms were about equally divided between the right and the left. It was not rare to find the symptomless foot used in objectively the worse position.

Duration at Entrance.

		Percentage.
One month or less	105	12.7
1–6 months	278	33.8
6 months to 2 years	251	30.8
More than 2 years	188	22.7
	822	100.0
Unrecorded	178	

In slightly less than half the cases the duration of symptoms at entrance was six months or less. The duration of symptoms, however, was often entirely disproportionate to what must have been the duration of the deformity, a week or two of pain only being not uncommonly attributed to at least a year or two of flat foot. Moreover, as shown in several investigated cases, a patient, especially of the working class, learns to spare his feet unconsciously; and, until he suffers a decided increase of pain, due perhaps to some unusual exertion, he regards what discomfort he has as natural fatigue. It is believed, therefore, that the duration as tabulated is too short.

SYMPTOMS.

		Percentage.
Pain in feet only	643	68.1
Pain in feet and above	244	25.9
Pain wholly above feet	21	2.2
Disability or deformity (practically painless)	36	3.8
	944	100.0
Unrecorded	56	

In slightly more than 95 per cent. of the cases, therefore, pain was the leading symptom, and in slightly more than two-thirds of these painful cases the pain was in the feet and ankles only. Special interrogation of 125 cases, however, would seem to show that this proportion of cases with pain wholly confined to the feet or ankles is too large. Of the 36 painless cases, 19, or more than half, were under twenty years, although of the whole thousand only one-sixth were under this age.

LOCALIZATION OF PAIN IN THE FOOT.

The pain in the foot was often variable and diffuse, so that the patient could not refer it to any exact site. The records, moreover, usually mention the "foot" or the "ankle" as the location of the pain. Following are exact data, as far as obtained. When pain was referred definitely by the same patient to two distinct spots, the case was entered in the table twice.

Astragalo-scaphoid articulation (and immediate vicinity)	164
Heads of metatarsals	116
Centre of heel (plantar surface)	106
Sole generally	30
Between external malleolus and cuboid	24
Plantar surface of head of first metatarsal	8

Pain in the foot, therefore, usually diffuse or variable, when localized, was most frequently referred to the astragalo-scaphoid joint.

Localization of Pain above the Ankle Associated with Pain in the Foot.

When pain was definitely referred by the same patient to two parts, as the knee and the back, it is entered twice, thus making the total larger than the whole number that had pain above the ankle associated with pain in the foot.

Calf (including front of tibia)	147
Knee	73
Back	32
Hip	14

The calf, therefore, was much the commonest place for pain above the ankle associated with pain in the foot.

Localization of Pain Wholly above the Ankle.

Of the 21 cases of static foot trouble without subjective foot symptoms, 13, or more than half, had pain only in the knee, usually over the internal condyle, and 4 others had pain in the knee associated with pain elsewhere above the ankle. In these cases the examination of the knee was negative, except perhaps for slight hyperæmia of the joint membranes. Exact figures cannot be given, but in several of the cases the causal relation of the static error in the foot to the knee trouble was attested by prompt improvement of the knee following correction of the foot. The relation of static foot trouble to knee symptoms, as seen in the clinic, is commoner than the thousand cases would thus indicate; for cases of well-developed simple villous arthritis of the knee are found frequently associated with pronated or flat feet. But, although the static foot error may well have been the fundamental cause, and although part of the treatment is directed to the feet, these cases could not justly be grouped with the static foot cases, as the static foot element in them, whatever its causal importance, was no longer the chief factor.

Types of Static Foot Error.

To give the exact figures compiled regarding the types of deformity affecting chiefly the longitudinal arch would imply accuracy that is unwarrantable; for the nomenclature of the records has not been always uniform, and the types themselves are not distinct. In general, however, much the commonest type, occurring oftenest in massive feet of full-grown adults, was a moderate rotation of the sub-astragaloid tarsus about an anterior-posterior axis into a valgus position, together with considerable depression of the longitudinal arch during weight-bearing, but without much abduction of the fore foot; *i.e.*, not much rotation outward of the foot anterior to the astragalus about a supero-inferior axis (patient standing). Without weight-bearing the longitudinal arch in this type is normal or only slightly flattened, and during weight-bearing the arch is never entirely lost. The foot is relaxed and spread out. The next commonest type, occurring oftenest in slender feet, was moderate valgus, decided abduction of the fore foot, and an arch unusually high even during weight-bearing. The deformity in both these types is pronation, but with difference in the relative amounts of the three clinical components of pronation,—valgus, abduction, and depression of the longitudinal arch. The common incidence of a general type of deformity with a general type of foot, as noted above, suggests a determining difference in the internal conformity of the types of feet, especially of the calcaneo-astragaloid facets, as alluded to by Lovett and Cotton.* Other types observed were: (1) the thoroughly flat foot, with prominence of the scaphoid; (2) flattening of the arch of relaxed feet in weight-bearing, without commensurate pronation, due to apparently direct depression; (3) pes cavus, or the contracted foot, with short tendo Achillis, but no other evidence of paralysis.

In nearly all the cases the anterior arch was involved to some extent, in 156 cases notably spread and flattened, and in 116 cases, as tabulated, painful. In 68 cases the concurrence of spreading and flattening of the anterior arch, distinctive pain at the heads of the metatarsals (almost always centering at the head of the fourth metatarsal), and usually callous under the anterior arch, made the distinct diagnosis of broken anterior arch. Of these cases 41, or about three-fifths (only 2.9 per cent. more than the percentage of total female static foot cases), were women; 10 (2 men and 8 women) had had the definitely characteristic, sudden attacks of excruciating metatarsalgia, relieved by removal of shoe.

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* *Boston Medical and Surgical Journal*, Aug. 4, 1898.

The degree of deformity, whatever its type, was no indication of the severity of symptoms. A few of the cases complaining of pain had feet apparently normal, but were relieved by treatment of the inferred static error.

CONGESTION, VARICOSITY, HALLUX VALGUS.

Congested	65
Varicose veins	45
Hallux valgus, marked (Minor grades common.)	77

Of the 77 cases of marked hallux valgus 14, or 18.2 per cent., suffered from definitely broken anterior arches; while in the thousand cases the percentage of broken anterior arches was only 6.8 per cent.

SWELLING AND TENDERNESS.

The following tables are incomplete, and represent relative rather than absolute frequency. Swelling when diffuse, as commonly, is not included.

SWELLING.

		Percentage.
About astragalo-scaphoid articulation	33	58.9
About external malleolus	10	17.9
About both malleoli	6	10.7
Over dorsum	4	7.1
Prolonging heel cushion forward	3	5.4

TENDERNESS.

		Percentage.
Centre of heel	16	64.0
Over astragalo-scaphoid joint	6	24.0
Sole	2	8.0
Cushion of first metatarsophalangeal joint	1	4.0

In broken anterior arch there was usually tenderness about the head of the fourth metatarsal.

The commonest place for swelling was over the astragalo-scaphoid articulation, and the commonest tender point was the centre of the heel.

MOBILITY.

(In passive motion.)

Inversion restricted (with dorsal flexion, as a rule, also restricted)	130
Dorsal flexion restricted (with inversion practically normal)	45
Generally restricted	69
Increased	20
Normal	257
Unrecorded (presumably no restriction)	479
	1,000

In 88 cases, mobility, almost always in inversion, was sufficiently restricted, by spasm, adhesions, or adaptive changes in tendons or bones, to require special treatment. Of these cases 58, or 65.9 per cent., were men, contrasted with the 42.6 per cent. of male cases in the whole series.

In about one-quarter of the cases there was notable restriction of passive motion. In one-twelfth of the cases this restriction required special treatment. Restriction of motion requiring special treatment was commoner among men than among women.

TREATMENT AND RESULTS.

To make the results significant, it is necessary to give an outline of the treatment used. In a great majority of the cases (86.7 per cent.) a steel sole plate was advised, usually at initiation of treatment, sometimes after failure of other means, or in course of treatment. These plates were made as follows: A plaster impression was taken in each case, the patient sitting upright and allowing the partially corrected foot (or feet) to rest on the bottom of the pan of plaster. The cast made by filling this impression would then be gouged out, shaved, and marked for a plate of the shape and size needed by the particular foot. The plates were usually of No. 18 gauge steel, spring-tempered, covered with leather on both sides. The prevailing type of plate, chiefly for what has been described as the commonest type of deformity, was the square plate, supporting nearly the whole width of the sole from just anterior to the weight-bearing surface of the heel to the sesamoid bones of the great toe. A posterior outside flange, to keep the foot from slipping off, and a small posterior inside flange were used; but neither side as a whole was rolled up, and the scaphoid and the base of the fifth metatarsal were not enclosed. For broken anterior arches the plate was extended and raised under the heads of the middle metatarsals. Much abduction would be opposed by an anterior outside flange. High heel flanges and various modifications were used in needful cases. Flannel bandaging and supportive adhesive strapping were employed where indicated. Local and general tonic treatment, foot exercises, right shoeing, and correct muscular standing and walking were often recommended. Rigid valgus was treated by adhesive strapping in as much correction as possible, followed by plate when the foot became sufficiently flexible. Intractable cases were forcibly corrected by manipulation under ether, and retained overcorrected by plaster cast, followed by plate and usually Thomas sole. Thomas heels, or heel and soles, were occasionally used in promising cases in substitution for plates. Temporary felt pads and leather felt pads were among the measures employed. The treatment thus outlined represents only the routine, and does not give account of the adjustment of the routine to the individual.

Alteration of Plates.

Of the thousand cases 513 did not return for continued treatment. Of these, at the prevailing proportion of 86 per cent., 451 must have been cases in which plates were advised. This leaves, of the total 847 plate cases, 396 to form the basis of the following table. If these 396 had all diligently continued to follow treatment, the number of alterations needed and made would doubtless have been increased. It is probable, as will be shown later, that the need for plate changes among the 451 who did not return was no less than among the 396 included in the table.

Time after Application of Plate.	Under 1 mo.	1–2 mos.	2–6 mos.	6 mos.–1 yr.	1–2 yrs.	Totals.
Raised	103	29	28	13	2	176
Repaired, usually broken	7	6	31	34	7	85
Adjusted because painful	24	9	12	1	0	56
Lowered	3	4	3	2	1	13

Cases in which plates were raised more than once, each case entered only once in table: twice, 28; three times, 6; more than three times, 5. Alterations with time not specified, not entered in table, 7.

Thus in two-fifths of the plate cases returning for after-treatment the plates were raised, usually within a month. The need for this raising, due to the patient's becoming accustomed to the plate, to planter moulding and atrophy, and to elevation of the arch, was conspicuously shown by the relief it gave from returning symptoms. A higher plate at outset would, as a rule, apparently not have been tolerated. Indeed, the same plates, which in a few weeks unquestionably required raising, the patient at the beginning often could not wear steadily, but on account of the initial height of the plates had to become used to them gradually.

About one-fifth of the plates broke during the first year of use, usually due to continuous moisture and resultant rust. This breakage has recently been prevented apparently satisfactorily by galvanizing the plates with omission of the lower leather.

Results of Initial Treatment of Deserters.

513 cases of all kinds of static foot trouble did not return for after-treatment, and there are consequently no hospital records of the results of treatment. Of these cases, however, 85 have recently been examined or heard from, after a period since initial treatment (usually plate) averaging six to seven months; and the results subjoined will perhaps serve as a basis for estimating the results in all the deserters.

"Entire relief" in the following tables means without inconvenience of any kind from feet; "relief," occasional pain in feet, usually after much use; "slight relief," pain in feet less, but present more or less all the time; "no relief," pain as much as ever. Intermediate results are expressed by the one of the above terms nearest in meaning.

		Percentage.
Entire relief	21	27.6
Relief	33	43.4
Slight relief	4	5.3
No relief	18	23.7
	76	100.0
Treatment rejected	9	

About one-quarter, therefore (if the same proportions hold for all), of the cases that did not return after the initial treatment (usually plate), were entirely relieved, and slightly less than the same number were entirely unrelieved.

Results of Plate Treatment of Static Error affecting Principally the Longitudinal Arch.

	Under 1 mo.	1-6 mos.	6 mos.-1 yr.	Over 1 yr.	Totals.	Percentage.
Entire relief	5	28	13	21	67	32.7
Relief	8	56	21	7	92	44.9
Slight relief	3	8	3	2	16	7.8
No relief	3	17	2	6	28	13.6
Worse	0	0	1	1	2	1.0
	19	109	40	37	205	100.0

Of the cases involving principally the longitudinal arch, one-third were entirely relieved by plate treatment (of course with the accessory treatment as described in the outline of treatment) with after-treatment, and only one-eighth unrelieved, in contrast to only the one-quarter entirely relieved and the one-quarter unrelieved of the patients who received, as a rule, the same initial treatment, but deserted without after-treatment. The importance of after-treatment is further manifested by the improvement in results with the increasing duration of treatment. Thus, as shown by the table, about three-fifths of the cases under treatment more than one year were entirely unrelieved, while of the cases under treatment less than six months those entirely relieved were only one-quarter.

Results of Plate Treatment of Static Error involving Principally the Anterior Arch.

	Under 1 mo.	1-6 mos.	6 mos.-1 yr.	Over 1 yr.	Totals.	Percentage.
Entire relief	0	2	7	0	9	32.1
Relief	2	8	3	2	15	53.6
Slight relief	0	0	0	0	0	
No relief	0	0	1	3	4	14.3

Of the 10 cases with sudden, disabling metatarsalgia, 5 did not return after initial treatment, and have not been found. 1 was entirely relieved by plate for eight months; then attacks returned,—plate needed raising. 2 were relieved at end of a month by strapping of anterior arch and plate. Of the 2 remaining, 1 continued to have attacks of undiminished severity, but less frequently, and the other was entirely unrelieved, although both had been faithfully under treatment, for ten months and one and a half years respectively.

The results of treatment of cases involving principally the anterior arch were strikingly similar to those in the longitudinal arch cases: one-third entirely relieved, one-twelfth unrelieved, and the rest all relieved considerably. In the cases of sudden, severe metatarsalgia the results were not so good.

Thomas Soles and Plate Substitutes.

The results of treatment by Thomas soles without plates—entire relief, 2; relief, 4; slight relief, 1; no relief, 3—tend to show that this treatment even in picked cases was less effective than plate treatment, to which several of these cases had to come. Flannel bandaging and alternate hot and cold showering, or felt pad and strapping, were also used, in promising cases of mild static error of the longitudinal arch, to bridge the patient over to physiological recovery, without committing him to the plate-habit. In 16 such cases, only 4 were unrelieved, but later 1 came to Thomas soles and 5 came to plates.

Adhesive Strapping for Restricted Inversion.

	Under 1 mo.	1-6 mos.	6 mos.-1 yr.	Over 1 yr.	Totals.
Entire relief or relief	3	5	1	0	9
Slight or no relief	0	3	0	0	3
Flexible	4	2	1	0	7
Still rigid	0	3	1	2	6

In three-quarters of the cases with restriction of inversion sufficient to require corrective adhesive strapping the pain was entirely or much relieved, although the flexibility was much improved in only half of a series of similar cases. The relief of symptoms without restoration of mobility, even with the plate, usually did not continue long after the last strapping.

FORCIBLE CORRECTION UNDER ETHER.

	1–6 mos.	6 mos – 1 yr.	Over 1 yr.
Flexibility nearly normal	3	1	0
No record of change of mobility, but symptoms relieved	2	1	0
Rigid again	6	5	1

Thus in two-thirds of the cases of forcible correction under ether, the valgus and rigidity, in spite of plaster cast, adhesive strapping, and plates, returned, although in several cases forcible correction was repeated, and in one case was performed five times, with unpreventable return each time of rigid valgus, due to peroneal spasm. In these not uncommon cases of spasm of the peroneals, resection of a short musculo-tendinous piece of the two muscles and their common sheath has recently, in the clinic, been giving apparently satisfactory and permanent results.

REMOVAL OF PLATES. CHANGE OF HABITUAL FOOT-POSTURE.

Among the 350 plate cases in which results are known, although half and more had worn their plates over six months, only 15 removed their plates with relief (6) or entire relief (9). Of these 15, 5 had worn plates less than six months, 5 six months to a year, and 5 more than one year. The majority of these gave up plates without advice. 6 cases, 1 after three years of plate-wearing, are known to have made, without advice, determined attempts to give up their plates, but were forced back to them by returning pain. The unavoidable inconvenience of plates and the natural desire to be rid of them, as illustrated in these 6 cases, and the common return of symptoms after breakage of plates make it improbable that any considerably larger number of the 350 plate cases than the 15 could have discontinued their plates with comfort. The 95.7 per cent. of all the plate cases in which the results are known continued to wear their plates because they could not do without them. After more than six months, on the average, they subjectively needed plates as much as ever.

To explain this continued subjective need objectively, the prevailing foot-posture in standing and walking was observed in 125 cases, nearly all of whom had steadily worn plates for averaging six to seven months, and compared with the recorded posture at entrance. These comparisons could not be made accurate, because, as before noted, there was no accurate method of measuring and recording the posture,* even if this posture had been uniform during the observation, and not shifting, requiring a composite judgment; but, roughly speaking, it seemed unquestionable that in nearly all the cases, painful or painless, plate-wearing or cases in which plates had been successfully discarded, with the exception of the abducted-pronated feet of growing boys and girls, there had been produced by the plate-wearing no practical change in the prevailing posture of the feet when used without plates, although, as indicated by the common need for plate-raising, the sole was moulded and hollowed, and the arches were apparently more easily elevated by artificial support. The muscular control, also, as a rule, did not appear improved.

Some Reasons and Remedies for Failure to Relieve.

Some of the reasons for failure entirely to relieve or to maintain entire relief that have been made obvious by a review of the series in light of the results may be summarized as follows:—

1. Patient's failure to return for after-treatment (raising or adjustment of plate, etc.). The patient regards the plate as a shoe which is to be worn unchanged until worn out.

2. Patient's failure intelligently and resolutely to co-operate in achieving cure. The patient expects that the plate will cure

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*An effort to measure pronation by the angle between the intermalleolar diameter and the long axis of the foot proved, as in the experience of Drs. Lovett and Cotton, unprofitable, because the relation of the amount of abduction—*i.e.*, increase of the angle—to the amount of pronation is not constant.

his foot in the sure, quick, lazy way in which the charlatan's specific holds forth to cure consumption.

3. Remaining or returning interference with correct weight-bearing position and normal mobility of the foot (spasmodic or shortened tendons, intertarsal adhesions, bony obstruction).

4. Mistake for a simple static foot trouble of a foot trouble partly static, but chiefly symptomatic of some other condition (arthritic or polyarthritic, circulatory, neurological, etc.).*

In a comparatively few of the cases the reason or reasons for failure to relieve are obscure, and in spite of painstaking treatment diligently followed relief was not afforded. In one case, for instance, thorough local and general treatment, including general institutional hydrotherapy, was followed for six months before relief began to come.

These reasons for failure to relieve imply the corresponding remedies too plainly to bear mention. One remedy, however, it is believed, cannot easily be over-emphasized,—the patient's intelligent, resolute co-operation. Such co-operation, though, especially in a hospital clinic, often hindered and sometimes prevented by the character of the patient, depends in all cases upon effective instruction and encouragement, varying of course with the kind of patient and the kind of foot. The patient should be told and shown how to stand and walk to the best mechanical advantage, by the voluntary correction of pronation and the muscular use of foot and toes. Special exercises, correct shoes and footwear, home manipulation for restriction of mobility, tonic bathing, local or general, and increase of physical vigor should, in needful cases, be explained and advised. These means of self-help, intelligently and resolutely used, with or even without a plate substitute temporarily, would in a considerable number of cases, it is believed, be sufficient, thus avoiding the plate-habit. The engaging, suggestive effect of a plate, however, more than of any plate substitute or of any other measures, is, in treatment of many cases, a factor of real importance. If a plate is used, it should be explained to the patient that the plate will probably need raising or alteration, and in most cases that it is to be regarded only as a temporary crutch, in addition to the rest of the treatment, which is to be discontinued, under advice, as soon as possible. For painlessness through plate-wearing, although in some cases the best possibility, is never perfect cure.

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*No static foot trouble is without a cause, and strictly is always symptomatic; but by simple static foot trouble is meant foot trouble due more to the weight-bearing error than to the greater or less complex of causes from which the weight-bearing error springs. It is only the former cases of which, as before stated, the present series was intended to be composed.

V.

A CASE ILLUSTRATING THE OPERATIVE TREATMENT OF PARALYSIS OF THE SERRATUS MAGNUS BY MUSCLE GRAFTING.

A. H. TUBBY, M.S., LOND., F.R.C.S., ENG.

Gentlemen: When I received your President's kind invitation to attend this gathering of my American confréres I felt that although I am unable, much to my regret, to be present, yet I should esteem it an honor if I were allowed to send a short account of a case of paralysis of the serratus magnus which has been treated successfully by an original method.

This deformity is sometimes bilateral but more often unilateral. It arises from a variety of causes which it is not needful here to enumerate. In the case I am about to quote the origin of the trouble was probably infantile paralysis. The notes of the case are as follows:

Winifred E., aged seven years, came under my observation at the Westminster Hospital on July 19, 1903. The left scapula stood out from the body giving the appearance of scapula alata. On abducting the arm to the horizontal position the scapula was nearer the vertebral column than on the sound side and the posterior border stood out so much from the chest that the fingers could be inserted beneath it so as to grasp at least the lower third of the bone. When the left arm was put forward horizontally in front of the chest the posterior edge of the scapula receded from the thorax causing a deep groove at this part. The appearances described are well seen in Figs. 1 and 2. Elevation of the arm above the shoulder was much weakened and there was considerable diminution in the length of the reach of the left arm. The external thoracic nerve and the muscle itself, on being electrically tested, gave the reaction of degeneration.

It appeared to be hopeless to expect any improvement by

Presented at the Eighteenth Annual Meeting of the Association, Atlantic City, N. J., June 8–10, 1904.

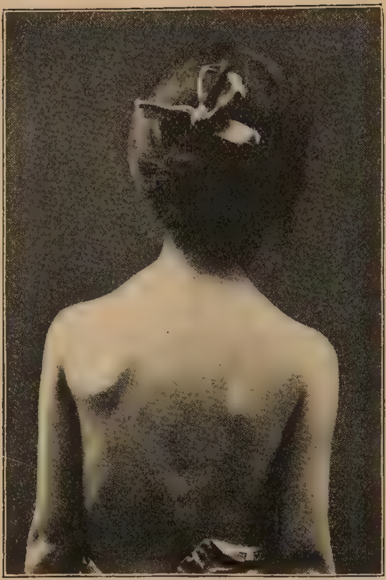


FIG. 1.—PARALYSIS OF SERRATUS MAGNUS. BEFORE OPERATION.

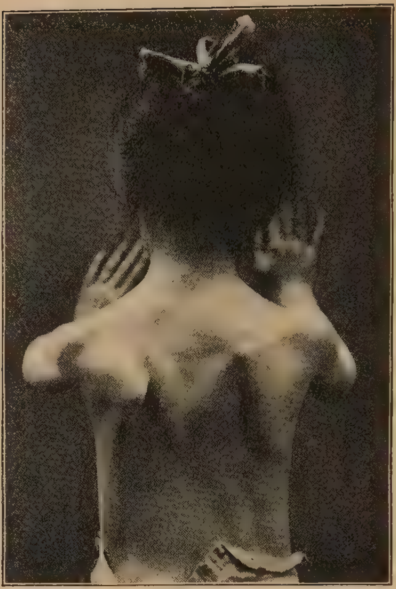


FIG. 2.—PARALYSIS OF SERRATUS MAGNUS. BEFORE OPERATION.

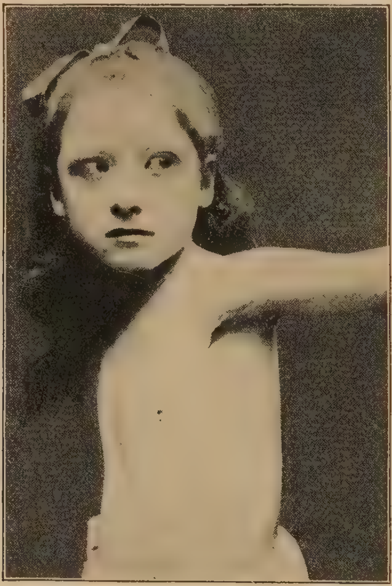


FIG. 3.—PARALYSIS OF SERRATUS MAGNUS. AFTER OPERATION. SHOWING LINE OF INCISION.

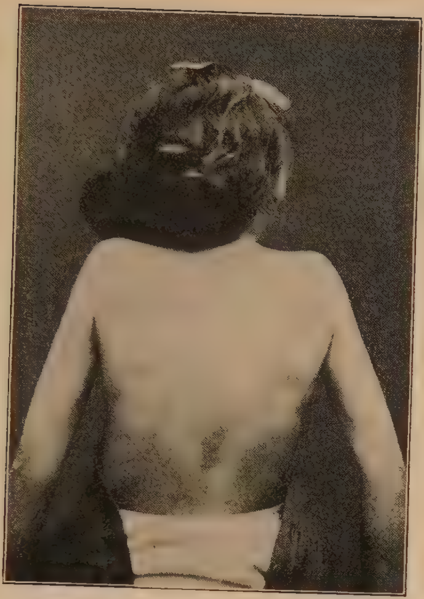


Fig 4.—Paralysis of Serratus Magnus.
After Operation.

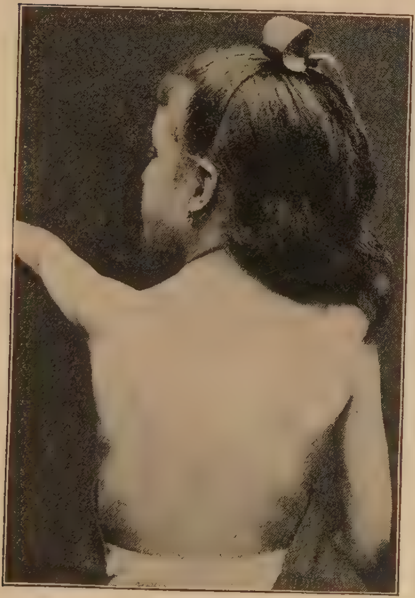


Fig. 5.—Paralysis of Serratus Magnus.
After Operation.

the usual methods of massage, faradism, and galvanism, so I determined to see if it were not possible to transfer power from a healthy muscle. After a little reflection it occurred to me that by utilizing a portion of the pectoralis major the desired effect would be accomplished. An incision 6 inches in length was made following the anterior border of the axilla, the resulting scar is seen in Fig. 3. A flap of skin and subcutaneous tissue was then turned down, and by dissection and the free use of retractors a large part of the sternal portion of the pectoralis major was exposed. Its attachment into the humerus was then freed and the muscular fibers of this portion separated from the surrounding tissues for a considerable distance. The next stage was to define the serratus magnus. This was found pale and atrophied. The object now to be achieved was to insert the cut end of the pectoralis major into as much of the width of the serratus magnus as possible and this was done by dividing the cut end of the pectoralis into several fasciculi, then drawing the paralyzed serratus well forward the fasciculi of the pectoralis were firmly stitched with silk to the serratus magnus over an area corresponding to four or five of the digitations of the latter. The arm was then put up in a sling with the elbow to the side and carried forward. The wound healed quite well and after six weeks the following results were noted: As the child stood, there was no perceptible difference in the prominence of the inferior angles of the two scapulæ, see Fig. 4. Further the child could abduct the extended arm well above the horizontal position and had acquired also the power of thrusting the arm forward as in fencing, see Fig. 5. She has been seen at intervals since the operation and the improvement has been fully maintained while there is no loss of power in bringing the arm across the chest resulting from diversion of part of the fibres of the pectoralis major.

This is a solitary case in which this treatment has been tried but I venture to bring it to your notice in the hope that some of you may give it a trial and report the results.

VI.

TYPHOID COXITIS, WITH REPORT OF A CASE, WITH SKIAGRAMS.

JOHN L. PORTER, M.D., CHICAGO.

That typhoid infection of the hip and other joints occurs as a complication of the intestinal infection has been recognized for several years, but it is seen so rarely, and so little is known of the pathology, that we find few references to the condition in the literature. Yet the result of hip joint infection is often serious, and anything that adds to our knowledge is of interest. Involvement of the hip in the course of typhoid enteritis seems to be a complication which usually develops late in the disease. or even during convalescence. The pain is often severe, though the patient may only complain of slight pain or discomfort about the joint.

Swelling develops slowly and, on account of the thickness of the muscles about the joint, may progress to a considerable degree before being noticed.

The first thing to call the physician's attention to the joint may be the fact that the patient cannot lie on that side, or that he keeps the thighs flexed.

In a patient weakened by a prolonged intestinal typhoid, with sensibilities somewhat obtunded, we can readily see how a slowly progressive synovitis, with little pain, may proceed to a considerable degree before being noticed.

The one peculiar thing about these hip infections is the tendency to spontaneous dislocation of the joint, and it is this feature which makes typhoid coxitis such a serious condition.

Keen, in the series of 84 cases which he collected, found that spontaneous dislocation occurred in 43, or over 50 per cent.[1]

Presented at the Eighteenth Annual Meeting of the Association, Atlantic City, N. J., June 8–10, 1904

That dislocation should occur so frequently may seem strange, but the mechanical reason is very simple. The joint becomes distended with fluid, and the thigh is kept flexed and adducted.

The distention of the joint lifts the head out of the acetabulum and the adduction rotates the head inward and against the upper and outer border of the acetabulum. In this position the joint is most easily dislocated, and the contraction of the thigh muscles with no opposition—the ileo-psoas group being relaxed—furnishes the power. But, added to this mechanical cause, there is also probably an actual destruction of the tissues in the joint in many cases, which aids in producing the displacement.

As to the bacteriology, little is positively known.

Grancher obtained typhoid bacilli from an acute tenosynovitis following typhoid.[2]

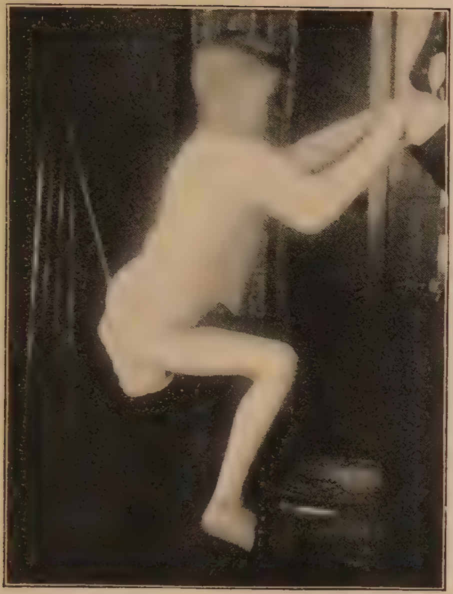
Orloff found a thick, tenacious, turbid fluid followed the injection of typhoid cultures into the joints of dogs and rabbits, which, after a few days, became purulent, and the typhoid bacilli disappeared.[3]

Keen cites 5 cases in which examinations of the fluid in the joint were made. In one, Staphylococcus aureus and albus only were found. Three were sterile, but one of these had an abscess outside the joint, involving the trochanter, which contained typhoid bacilli. One contained bacilli resembling typhoid, but were not identified positively.[4]

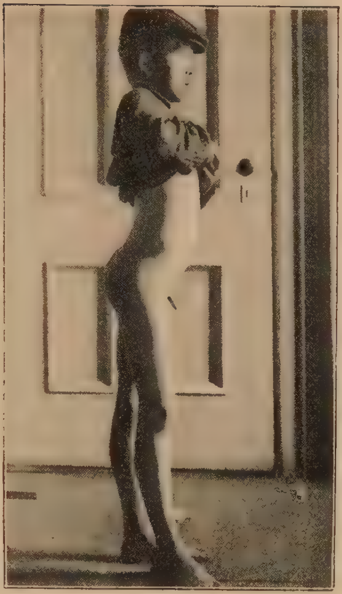
Goldthwaite believes that the result to the joint probably depends upon whether the synovitis is due to the presence of the typhoid bacilli, or is only the effect of their toxins. Keen thinks that while the bacilli may be present during the acute synovitis, they are destroyed later by leucocytosis or some other agency, and disappear from the synovial fluid, thus accounting for the fluid obtained being sterile in several instances.[5]

This gap in our knowledge of the subject can only be filled by making cultures from the aspirated fluid at intervals, beginning with the acute onset.

As to the gross pathology, Graff has reported several cases of spontaneous dislocation following typhoid and other acute



Typhoid Hip. Before Operation.



Typhoid Infection of both Hips. After Operation. (See History.)

Typhoid Hip taken Eight Months after Operation.

infections of the joint, with Röntgen pictures showing flattening or destruction of the upper rim of the acetabulum. He believes that the synovitis is sero-fibrinous in character, and that beside causing a distention of the joint, it produces an inflammatory softening of the acetabular margin, and the pressure of the head of the femur, by contraction in a flexed and adducted position, causes a pressure atrophy of the outer part of the acetabular rim, permitting the head of the femur to slip slowly out.[6]

It is with the hope of adding something to our knowledge that I present these skiagrams and history of following case:

Case 1.—E. D., ten years old, about October 10, 1901, was taken sick with headache, loss of appetite, nausea, fever, pain in back and different parts of the body, and especially in the abdomen. The trouble steadily grew worse, and on October 15 the family physician made a diagnosis of typhoid. The fever persisted about three weeks, ranging from 102° to 105°. It then began to subside gradually, but on November 14 (five weeks from onset) had a marked chill, and pain in left thigh and hip. The thigh became flexed on the abdomen and any attempt at motion caused severe pain. A purplish-red spot appeared near the trochanter, and about two weeks later ruptured and discharged a "core," and a quantity of thin, yellowish pus, and continued to discharge somewhat until February, 1902, the joint meanwhile getting better. After the chill of November 15 (preceding the joint symptoms), the fever persisted for about three weeks, and gradually subsided. It remained normal for two or three days, and then (about December 7) another elevation occurred, lasting about ten days. At this time had severe pain in *right* groin, the right thigh became flexed, and motion very painful. He gradually recovered from this attack, and on Christmas day was allowed to sit up, but the right hip remained flexed and sensitive to motion. By the middle of February, 1902, the patient had apparently completely recovered from his illness; the sinus into the left hip had closed, but the deformity in the right hip persisted. Had no pain after that in either hip, except on violent motion.

June 21, 1902, patient came under my observation with following condition:

Case 2.—Boy, about ten years old; looks healthy and well nourished. Walks with a crutch, and cannot stand without support. Right thigh flexed at 90°, and adducted so that it touches the left. The trochanter very prominent under the gluteal muscles on the dorsum ilii. Motion at the hip lost, except slight flexion. Head of the femur cannot be felt. No scars about the hip; no evidence of synovitis. No pain on attempted motion, except extreme force is used. The resistance to motion seems like ankylosis. No muscular rigidity. Near the left trochanter is a scar about three-quarters of an inch long, but motion in left hip practically normal and painless. Since recovery he has been under treatment by an osteopath, who diagnosed dislocation, and said he could reduce it. But treatment has been fruitless. The boy has been to two surgeons, who advised resection of the joint. The father would not listen to any cutting proposition, and asked me bluntly if I could straighten the leg without. I took the skiagram herewith (Fig. 1), and then told him that if he would let me anesthetize the lad and do a tenotomy of the shortened adductors, which I explained to him, I would try to forcibly correct the deformity, but I was doubtful if it could be entirely straightened by that method. He consented.

July 2, 1902. Entered hospital.

July 5, 1902 Operation—tenotomy, forcible extension, sound of tearing adhesions and crepitus. Leg put up in plaster, with about 20° flexion.

July 15. Cast removed. Weight and pulley extension applied.

July 23. Extension removed. Cast put on. Flexion and lordosis somewhat less.

July 31. Cast changed.

August 14. Cast changed.

August 16. Went home.

Later, a Thomas hip splint was applied, and this was taken off each day and passive motion given the joint. Gradually this was discarded as tenderness subsided, and motion increased. Returned in October, 1902, walking without any support, with leg one inch shorter than the left, and some motion in all directions—least in flexion.

I believe that in the case just exhibited nature has distinctly pointed out that early evacuation of the joint is the satisfactory treatment. Both joints involved, but the one that opened and discharged spontaneously, although it was stiff and somewhat flexed when he got up, has recovered with almost perfect motion, while the other became dislocated, extensive destruction occurred in the acetabulum, and femoral head, the joint had to be straightened by operative measures, and now has only very limited motion.

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VII.

AN OPERATION FOR THE CURE OF CHRONIC BURSITIS, ESPECIALLY ADAPTED TO HOUSE-MAID'S KNEE.

PHIL. HOFFMANN, M.D., ST. LOUIS.

More than six years ago,* I called attention to a simple operation for the cure of chronic serous bursitis, an operation especially adapted to the treatment of the condition known as housemaid's knee, an enlargement of the prepatellar bursa. Figs. 1 and 3. Before this publication, the operation had been tested in a number of cases during a period of three years. In view of the fact that most writers still advocate the severe operations of excision and curettage, it may be not amiss, after a ripe experience, to again bring before the profession the simple operation that has been almost uniformly successful in my hands.

The operation consists of puncturing the bursa, thoroughly scarifying its walls, expressing its fluid contents, bringing its walls in contact and holding them so by means of a compress until their raw surfaces have grown together and have thus obliterated the cavity.

An ordinary tenotome, having a long shank, or an especially devised instrument illustrated in Fig. 5, is passed into the distended bursa at its base. With the sharp edge its entire inner surface is marked with many fine cuts, after which the instrument is withdrawn and the bursa evacuated of its fluid contents through the small skin incision. A thick, wide pad of gauze is placed over the bursa and firmly bound down with strips of adhesive plaster, overlapping one another and completely encircling the limb from an inch or two above the upper margin to the same distance below the lower margin of the bursa.

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* St. Louis Medical Review, January 1, 1898.

Presented at the Eighteenth Annual Meeting of the Association, Atlantic City, N. J., June 8–10, 1904

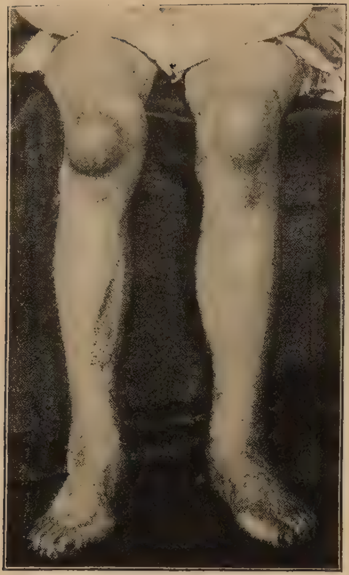


Fig. 1.—Bilateral House-maid's Knee. Two Years' Standing.

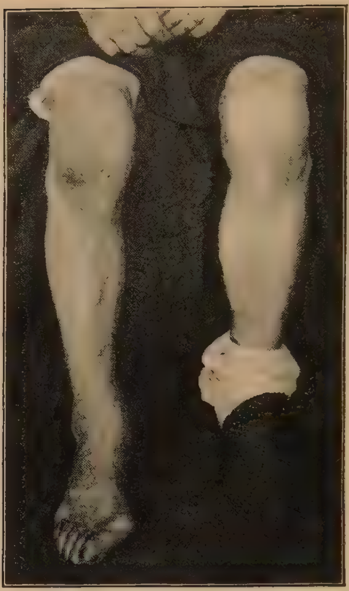


Fig. 2.—Same Case as Fig. 1. Four Months after Operation.

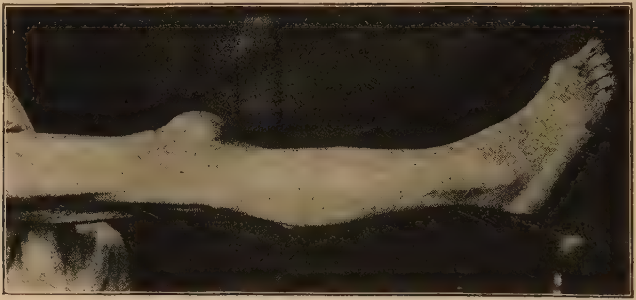


Fig. 3.—House-maid's Knee. Eighteen Months' Standing.

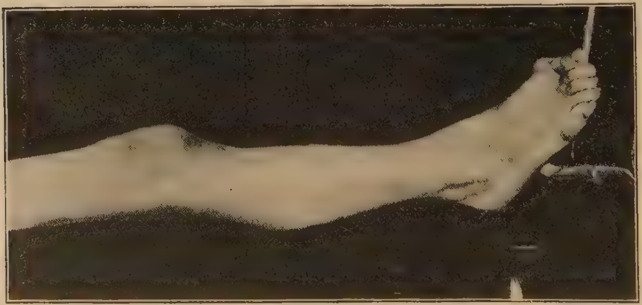


Fig. 4.—Same Case as Fig. 3. Thirteen Months after Operation.

Over this a muslin and a crinolin bandage are applied. A pad of cotton should be placed within the popliteal space, beneath the plaster, to protect the prominent hamstring tendons and overlying skin from undue pressure. The raw bursal surfaces should be kept in contact until firm union has occurred. Two weeks are sufficient. The adhesive plaster strips should be renewed or reinforced whenever they appear loose; as a rule every two or three days.

No anesthetic need be given as the operation is practically free from pain, except that produced by puncturing the skin. The bursal lining is not very sensitive and the scarifying gives little distress unless the shank of the instrument is rubbed too hard against the wound margin at the point of its entrance through the skin. Patients have frequently expressed surprise at the lack of discomfort during operation.

The patient need not be confined to bed or even use crutches during the after treatment, but may attend to almost any tasks, except such as require kneeling, immediately after operation. To illustrate: One of my first operations was performed upon a newspaper carrier, who had a chronic enlargement of the prepatellar bursa. He entered the clinic carrying his bundle of papers; the limb was immediately scrubbed with soap and washed with an antiseptic solution, the operation performed, the dressing applied, and in less than an hour and a half after entering the operating room he was distributing his papers, free from pain and with only such slight lameness as was caused by the tight bandage restricting motion at the knee. So, too, during my service at St. John's Hospital, I operated successfully upon two young women employed there for heavy housework. Neither lost a day's time, but both attended to all their usual duties, except such as required kneeling, and suffered little inconvenience. These histories are typical and not selected as exceptional.

I have frequently employed this operation in the treatment of distended popliteal and other bursæ, but not with the uniform good results experienced in the treatment of house-maid's knee.

Ideal compression can be made over the anterior knee bursa, which overlies the patella. Not so, however, over the popliteal bursæ, which are deeply situated and do not rest upon a smooth, hard surface, such as presented by the patella. Nevertheless, in a number of cases of chronic popliteal bursitis, which would otherwise have been subjected to excision, a cure has been effected by this method.

In the past nine years, I have operated upon 104 cases of house-maid's knee. In 2 the operation had to be performed twice and in 4 three times, while in 98 it was primarily successful.

Though having often successfully used an ordinary tenotome, I have devised the special instrument illustrated in Fig. 5, which has, at least, some theoretical advantages. As the blade is strongly curved and raised from the shank, its cutting edge can more easily reach all parts of the cavity without interference from the shank. The cutting edge of the scarifier fits the surface better than that of the tenotome. (See Figs. 6 and 7.)

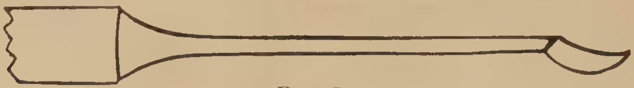
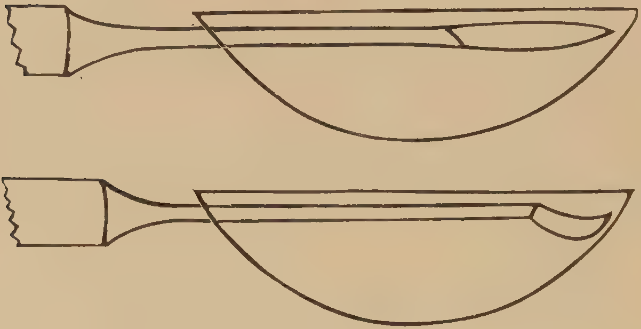


Fig. 5.


Figs. 6 and 7.

The principle of scarification and pressure has been advocated for the treatment of so-called ganglion at the wrist, but it has never, to my knowledge, been employed in the treatment of chronic inflammation of large bursæ before the operations referred to in my first paper.

Perhaps it will be well to state in closing that the scarification must be thorough, withdrawal of synovial fluid complete and the compression quite firm to assure success.

VIII.

TUBERCULOSIS OF THE ABDOMINAL LYMPH GLANDS: ITS COMPLICATIONS, DIFFERENTIAL DIAGNOSIS, AND TREATMENT.

CHARLES F. PAINTER, M.D., BOSTON, MASS., AND WILLIAM G. ERVING, M.D., OF WASHINGTON, D. C.

INTRODUCTION.

For many years intra-abdominal glandular tuberculosis has been recognized as a clinical entity, and much study has been expended in attempts to determine the methods of infection in these glands. It has not been noted, however, that disease of these structures could cause irritative symptoms in the spine in a manner similar to that in which lesions of the mediastinal glands not infrequently produce torticollis. Recent investigation is making it more and more manifest that there are several conditions in and about the spine not associated with a kyphos which give rise to many of the cardinal symptoms of vertebral tuberculosis. The purpose of this paper is to show that tuberculosis of the abdominal lymph glands may give rise to spinal symptoms; to distinguish symptoms produced in this way from similar symptoms produced by other diseases, and to suggest, though the absolute proof is wanting, that in some cases vertebral tuberculosis is caused by a direct extension from tuberculous abdominal lymph nodes.

ANATOMY AND PHYSIOLOGY.

The abdominal lymphatic glands may be divided into two chief groups, the mesenteric and the lumbar.

The former lie in the mesentery of the intestine, chiefly about its radix, intimately associated with the blood vessels. Their chief purpose is to pick out and to carry off the fatty portion of

Presented at the Eighteenth Annual Meeting of the Association, Atlantic City, N. J., June 8–10, 1904.

all ingested food, and their ramifications extend into the walls of the entire small intestine and of the greater part of the large intestine. They serve also as filters of the large expanse of mesenteric peritoneum and their efferent canals form the intestinal trunk.

The lumbar glands lie close to the lateral and anterior aspects of the vertebral column from the bifurcation of the aorta to the point of origin of the superior mesenteric artery. Aside from tributaries from the stomach and rectum they have no connection with the digestive tract, but through the iliac, hypogastric, and sacral plexuses, which drain into them, and through their lesser tributaries, they serve as the final filters of lymph from the lower extremities, the bony and soft parts of the pelvis and lower part of the trunk, the pelvic and renal viscera, the peritoneal cavity, and the spinal canal. They maintain anastomotic connections with the thoracic glands, but most of their lymph is drained into two lumbar trunks. These, uniting with the intestinal trunk, form the so-called chylocyst, the dilatation of the lower end of the thoracic duct.

Pathological Findings.

With such extensive ramifications and diverse functions, the abdominal lymph glands are necessarily subject to a wide range of infection, and that by the bacillus of tuberculosis is perhaps the most common. Although only occasionally diagnosed in life by careful examination or at operation, the postmortem records show tuberculous involvement of these glands in a surprisingly large proportion of cases.

In general miliary tuberculosis, these glands, together with the other lymphatic groups, are almost invariably enlarged, soft, and undergoing beginning caseation. Bacilli can be obtained from smears, and histological examination shows typical tuberculous foci.

In more chronic or localized tuberculous disease they are also frequently found involved, either as fluctuating caseating conglomerations, or as inactive calcified masses, from which all glandular appearances have disappeared. Less frequently they present the only tuberculous lesion to be found in the subject, as in 5 cases of a series of 120 fatal cases in children coming to autopsy, where the mesenteric glands were alone involved.

In infants and young children tuberculous infections are for the most part first manifested in the lymphatic glands. In these cases, the mesenteric and the bronchial glands show tuberculous foci in the majority of the fatal cases.

Such investigators as Simmonds, Batten, Colman, and Carr found the bronchial glands involved in three-fourths of their cases, and the mesenteric in one-half, while Woodhead placed the latter as high as 80 per cent. In adults, tuberculous infection more commonly occurs through the respiratory tract, and therefore involvement of the lymph glands is not so frequently found in these cases.

Morf, in a series of 232 consecutive adult autopsies from the Rush Medical College, in which careful examination of the abdominal lymph glands was carried out, found them involved by tuberculosis in 9 cases, about 4 per cent. König, in a similar series of 2230 autopsies, found them involved in nearly 2 per cent. The records of 1000 consecutive autopsies at the Massachusetts General Hospital, examined by the authors, through the courtesy of Dr. J. H. Wright, showed tuberculous lesions in some portion of the body in 182 cases. Of these, 55 cases showed tuberculosis of the bronchial, and 41 of the abdominal lymph glands. These cases, of which almost all were adults, show the condition to be fairly common.

Source of Infection.

There are three chief sources of tuberculous infection of the abdominal lymph glands. (1) Direct extension from adjoining diseased tissues; (2) infection from the blood stream; (3) infection through the lymphatics.

The first is uncommon and of minor importance.

The second, or infection from the blood stream, is not infrequent. When small numbers of bacteria invade the glandular tissue they are, as a rule, promptly destroyed, without symptoms, and with little or no damage to the glands themselves.

In severe infections the process is general in its nature; there is involvement in all the lymph gland groups, and miliary involvement of the viscera. Here the course of disease is acute, and death follows shortly. The autopsy shows all the lesions, save the old primary focus, to be of an acute character.

The third source of infection is through the lymphatics which carry the filtered bacteria to the glands and deposit them there. This is the usual picture presented in tuberculosis of the abdominal lymphatics, and is almost invariably the mode of infection in the more or less chronic and isolated gland lesions.

In young children the infection is usually from the alimentary tract, and the mesenteric glands are the groups most frequently involved.

That bacteria may pass through an intact intestinal membrane, leaving no lesion behind them, and thus enter the lymphatic system, seems to be definitely proved by careful postmortem investigations and animal experiments, while histological examination shows that often the leucocytes which pierce the walls and follow the course of the lymph channels to the glands are the carriers. Infection, though possible under these normal adverse conditions, is doubtless more prone to occur when the intestinal resistance is lessened by a mild chronic catarrhal condition, so common in children, or by some other lesion.

The posterior lumbar groups are more frequently subject to infection from tuberculous pelvic organs or vertebral disease. This last source, though mentioned over fifty years ago by Bamberger, has been but little noted.

Course of Disease.

A lymph gland in which a focus of tuberculosis is present remains always a source of danger to the rest of the body. The gland, which no longer functions but has become a cystic conglomeration of tuberculous detritus, may undergo tuberculous calcification, and the focus be permanently walled up, but even in these cases the organisms may remain alive indefinitely. That this is a common termination is shown in numerous cases by subsequent examination, either at operation or autopsy, when this unsuspected lesion has been revealed.

Frequently, however, the process finds soil more suitable for its growth; there is rapid involvement and enlargement of one gland after another by means of the connecting lymphatics, until the abdominal cavity is filled to a great extent with masses of glands which crowd the intestines into small compass, or involve them in a maze of adhesions. The process is often gradual in its onset. For months, or even years, there are but slight or occasional symptoms, chiefly dull pains persisting for long intervals, and deep localized tenderness. The symptoms gradually increase in frequency and severity. The abdomen becomes distended and ascites develops, due to pressure on the great vessels, or jaundice follows partial closure of the bile ducts. Marked cachexia results from interference with the function of the intestinal lymphatics, intestinal disturbances become more marked as a condition of chronic obstruction appears, and usually late in the disease large irregular masses in the abdomen are easily palpable. Such is the so-called tabes mesenterica, of which the termination is death from inanition and toxemia.

Complications.

Often the glandular involvement is more or less localized, and it is to complications that the fatal termination is due.

1. *Intestinal Obstruction.*—Complete intestinal obstruction, both chronic and acute, is not infrequent following simple pressure on the intestinal wall from the glandular mass or as a result of stricture due to adhesions binding intestines and glands into an inextricable mass. Much less frequently occlusion follows secondary involvement of the wall of the intestine itself.

2. *Peritonitis.*—The glandular cyst-like masses may reach enormous size, and here the danger of rupture presents itself, the sac evacuating its contents in the line of least resistance. If this be through the peritoneum, a local or general peritonitis follows, the latter quite frequent, and usually terminating fatally. Cases in the literature show direct rupture into the cavity and the presence of varying amounts of tubercular pus to have been the cause of the resulting peritonitis, though theoretically there may possibly occur a back flow in the lymph

channels between the glands and the peritoneum, bringing about a similar result.

3. *Formation of Abscesses Progressing Outward.*—Frequently the encysted collection of tuberculous detritus, instead of rupturing into the peritoneum, follows the general course of the psoas abscess of Pott's disease, and points either in the loin or in the thigh below Poupart's ligament, when it ruptures spontaneously. There may be no rise of temperature, but pain or limitation of motion in one or both hips may follow pressure upon the psoas muscle. Pain in the thighs or calves due to pressure upon the posterior nerve roots is also not infrequent.

This condition is well illustrated by Case 1 which offers the best evidence we have of the extension of the process from the glands to the spine.

This case was that of a young man who had symptoms of spinal rigidity with referred pain in the thighs, a condition which suggested an osteo-arthritic process, and for which a leather jacket was applied. This he wore nearly a year, and upon his return at the end of that time, he had an enormous abscess of the right abdomen and thigh, which was evacuated, and ten days later he died of intestinal obstruction from the pressure of glands upon certain coils of his intestines. The oldest tuberculous lesions were those in the caseating abdominal lymph nodes, and though the pathologist reports that the tuberculous disease in the vertebræ directly opposite these glands was apparently central in origin, it seems more than probable that it was due directly to an extension from the glands to the vertebral column, possibly through the lymph stream draining that region. There was no kyphos.

Differential Diagnosis.

Pathological conditions in the abdomen simulating tuberculosis of the mesenteric glands have been too fully described to need further mention, coming as they do in the field of the abdominal, rather than the orthopedic, surgeon.

Among cases with spinal symptoms, mesenteric tuberculosis must be differentiated from Pott's disease, aneurism of the abdominal aorta, malignant disease, especially cancer, osteoarthritis, osteo-myelitis, and other inflammatory diseases in or about the spine.

1. *Vertebral Tuberculosis.*—The presence of a definite vertebral kyphos is ordinarily pathognomic of Pott's disease, though the two conditions may be coëxistent. In children and young adults the appearance of a kyphos almost always reveals the true diagnosis very early in the process. In the adult, however, sufficient symptoms occur prior to the deformity to lead the patient to seek advice, and in such cases the following points aid materially in distinguishing between the glandular and the osseous type of disease.

The rigidity of the spine in cases of true osseous involvement is much more sharply defined than in cases due to pressure from outside. The restriction in vertebral tuberculosis is uniform in all directions, and is evidently spasmodic and in no way mechanical, as in other conditions. Limitation of motion is most evident in flexion. Lateral bending is less markedly but symmetrically impaired. The abscess accompanying vertebral disease is usually a definitely sausage-shaped tumor conforming to the shape and direction of the psoas muscle, in the sheath of which it lies. The glandular abscesses lie anterior to the psoas, and in consequence point very infrequently in the back. Irritation and contraction of the psoas, though common in the glandular abscesses, results only from direct pressure of the abscess upon the muscle. Glandular abscesses also tend to close much earlier than do those from an osseous focus, because single glands or small groups of glands oftentimes break down without carrying with them the entire lymphatic chain of that region. Here too the pain and discomfort is much less than in the cases of osseous disease, as a rule, and it is not until extension takes place to the bone that pain becomes pronounced. The night pain of bone tuberculosis is a conspicuous feature which is absent in the glandular cases; in the latter pain is frequently referred to the thighs, most commonly to both. The constitutional impairment of the type of glandular tuberculosis giving rise to spinal symptoms as distinguished from that produced by the true tabes mesenterica is generally not so grave as is ordinarily caused by an osseous vertebral tuberculosis. The final test to be applied is that of a good x-ray, which should, in those cases where the disease is below the eleventh or twelfth dorsal vertebra, show evidence of a positive character, either as regards the osseous or the glandular process. (In the paper presented earlier in this session by Dr. Osgood, the points in the differential of the osseous from the non-osseous processes have been brought out, and I need only briefly refer to that in passing.)

2. *Aneurism.*—As has been intimated, anything causing pressure upon the vertebræ may give rise to pain, to limitation in action, and to deformity. In this category comes abdominal aneurism. A recent case served forcibly to impress upon the writers the difficulties in diagnosis. A man forty-eight years of age came to the clinic complaining of pain referred to the lumbar spine, the buttocks, and down the left thigh. There was some lateral deflection of the trunk on standing, and his spinal motions were restricted, especially to the right and in flexion. He had been wearing a plaster jacket on the supposition that the trouble was osteo-arthritis, but had not improved; his pain was constant and very severe. Jackets carried low to give more perfect fixation were ineffectual, and seemed rather to increase his discomfort. During an extremely severe attack of pain he collapsed, and a pulsating tumor mass suddenly appeared in the left loin. The diagnosis of abdominal aneurism was made by Dr. Munro and immediate laparotomy was performed, which revealed a large dissecting aneurism of the abdominal aorta at the point of origin of the celiac axis. The aorta was tied, and death followed. This is the only fatal case the writers have known, although there was one other in a younger man who died after leaving the hospital of what was said to be an aneurism. Three or four others have been seen and recognized by the writers. The general condition of these patients is fairly good, provided they have not been exhausted by long continued pain, as was the case in the patient cited. Spinal mobility is restricted when the aneurismal sac lies in contact

with the vertebral column and erosion has begun. Limitation of spinal motion varies with the point of pressure, and unlike that of Pott's disease which is usually asymmetrical. Theoretically, it seems possible that a knuckle could develop from the erosion of an aneurism, though this has never been observed by us. The extreme and unremitting pain and its failure to be relieved by adequate fixation, together with the possibility of palpation of a pulsating tumor deep in the abdomen are the principal points in diagnosis. Middle age, atheroma, and the causes which tend to produce aneurism in the adult are suggestive. All the cases seen by the writers have been in males. Pain referred to the legs is not so constant as in some other conditions of intra-abdominal pressure.

3. *Neoplasm.*—Malignant disease of the spine in the adult is usually carcinoma and is rarely, if ever, primary in the vertebræ. The primary focus is usually in the breast or in the intestine. A few cases have been observed where the diagnosis was provisionally made and positively confirmed by autopsy. The chief difficulty lies in the differentiation from an osteoarthritic process, since the clinical picture of asymmetrical spinal limitation, with the absence of kyphos and of abdominal signs, is strongly suggestive of both diseases. In one case, that of a young woman, this doubt was removed when it became known that a breast had previously been amputated for cancer, and furthermore, an x-ray of the spine showed the malignant character of the process. The second case was an elderly physician whose excruciating pain was not relieved by fixation; he progressively lost ground, became more and more cachectic and emaciated, and finally succumbed. The primary focus was found at autopsy to be situated in the head of the cecum. Pain in vertebral carcinoma is deep seated and does not usually radiate. It is little relieved by fixation; is attended with progressive emaciation and cachexia, and usually occurs in elderly people. Sometimes a slight antero-posterior deformity occurs. Numbness and prickling in the feet and legs are occasionally noted. Sensory peripheral disturbances are more marked than motor.

4. *Osteo-myelitis.*—Osteo-myelitis of the spine is a comparatively rare condition. There should be no difficulty in differentiating it from tuberculous abdominal lymph glands if seen in the acute stage of the process, and the history should establish the diagnosis at once in chronic cases. The general condition of the patient with acute osteo-myelitis is very striking. The picture is that of a more or less profound septicemia with a rapid onset, high temperature, acute pain, early and rapid abscess formation, rarely any kyphosis, rigidity of spine to all motion, due to muscle spasm. The character of the abscess is that of an acute pyogenic infection with redness, heat, bogginess, and great tenderness. The abscess may point posteriorly, or appear in the pelvis, suggesting an appendicular abscess, as in one case seen in the hospital. In this case, operation showed it to be subperiosteal, and it was drained through a lumbar incision.

5. *Osteo-arthritis.*—The hypertrophic form of arthritis occurring so frequently in the spine has many features in common with mesenteric glandular tuberculosis. The patient's general health is seldom if ever impaired. Spinal motions are restricted and there is no localized kyphos, but a permanent antero-posterior or lateral curve of the entire column may be present. Restriction of motion is asymmetrical and varies in character at different levels of the column. Pain is rarely very severe, and if the spinal limitation is in the lumbar region unilateral leg pain is common. This is more commonly referred to the back of the thigh and calf. Atrophy of the gluteal region and of the thigh and calf on the affected side is very common, and is not atrophy of the muscles, but of the skin and subcutaneous tissue. There is no abscess formation in this disease. Adequate fixation gives prompt relief. If the disease is above the lumbar region restriction of respiratory excursion is common.

6. *Infectious Arthritis.*—The infectious processes which attack the other articulations of the body may involve those of the vertebral column with similar results. Usually only the supporting ligaments are involved, but in some cases erosion of cartilage or even destruction of bone may occur, with resulting

ankylosis. In the milder infections when no erosion occurs, the spinal ligaments and the capsule of the intervertebral articulations become infiltrated and the whole column becomes rigid. As the acute process subsides motion returns in varying degree. The clinical picture of this disease is distinct from that of any of the other processes which cause partial or complete rigidity of the spine. The entire column is usually involved and a rounded total kyphosis is common. No motion is permitted in any direction. The onset is commonly acute, and one or more large joints are usually involved.

7. *Spinal Rigidity from Intra-abdominal Inflammatory Conditions.*—Among the intra-abdominal inflammatory conditions which may produce rigidity of the vertebral column are appendicitis, inflammations of the gall-bladder, subdiaphragmatic, nephritic, and perinephritic abscesses. Mild cases of inflammation of the appendix may be confused with retro-peritoneal glandular tuberculosis. In both cases there is a varying amount of rigidity of the abdominal wall, and although tuberculous glandular involvement is usually accompanied by little elevation of temperature, the same condition is often present in chronic appendicitis, even when considerable tissue destruction has occurred.

The presence of the abscess formation resulting from either chronic appendicitis or tuberculous glandular involvement, when situated in the right hypochondrium (the location of the majority of our cases), usually causes rigidity of the right rectus, and impairment of spinal motions, especially toward the left. One must bear in mind, therefore, the possibility that an appendicular abscess may cause spinal limitation in addition to the symptoms which are wont to be regarded as pathognomic of the condition. Similarly, inflammations of the gall-bladder may be the cause of spinal rigidity, resistance to pressure on the right side of the abdomen, and of a mass palpable in a region not inconsistent with the distribution of the retro-peritoneal glands. It is, however, rare that the distinguishing symptoms of either appendicitis or gall-bladder inflammation are not present in addition to those above mentioned, and they must be carefully searched for before arriving at a positive diagnosis. Inflammations of the upper abdomen or of the pleural cavity which penetrate to that section of the abdomen immediately beneath the diaphragm are also capable of producing spinal rigidity, abdominal rigidity, and palpable tumor masses in the upper abdomen. Therefore one may occasionally have to exclude the cases of subdiaphragmatic abscesses in his differential diagnosis.

The writers have previously referred to the necessity for differentiating spinal inflammation from inflammation of the kidney substance, and it is not infrequently the case that large perinephritic or nephritic abscesses may occur, the pressure of which so irritates the muscles having their origin or insertion in the vertebral column that they draw it toward the seat of inflammation, which is outside of the column itself. The evidence of nephritic abscesses must then be sought for, that one may not fall into the error of overlooking this condition where spinal symptoms seem to be the conspicuous feature.

Treatment.

The treatment of inflammations of the abdominal lymph glands may be divided into three parts.

1. *General.*—As in all tubercular processes the general constitutional treatment is perhaps the most important, and all the factors which contribute toward the building up of the general system, enabling the patient to counteract the effects of the tubercular infection are to be encouraged. Outdoor life, freedom from labor, extra diet, and such drugs as contribute toward stimulating the appetite and regulation of all bodily functions are to be resorted to. Aside from this, medicinal remedies are of no particular value.

2. *Mechanical.*—Many conditions which do not directly involve the spine nevertheless require fixation of that structure in order to give relief from pain. This undoubtedly is due to the flexibility of the vertebral column and the fact that the retro-peritoneal glands are frequently intimately associated with the vertebral column itself or its immediate coverings. Free motion of the spine may easily act as a constant irritant to

such diseased glands. Therefore patients with peritoneal glandular disease in whom there has been no evidence of osseous process are usually sufficiently benefited by the application of jackets or the wearing of spinal supports of a less rigorous character to make it worth while to have them adjusted. The relief, of course, is not as marked as in the cases where involvement of the spinal column itself has been present. On the other hand, the painful symptoms of mesenteric tuberculosis are conspicuously less permanent than they are in the tuberculosis of the column itself.

3. *Operative.*—Ordinarily the greater proportion of the abscesses which result from inflammation of the abdominal lymph glands become absorbed and give no further symptoms. In certain cases a small portion of the total number of glands which have become involved break down. These may discharge through the abdominal wall or point in the thigh or at Poupart's ligament, the discharging sinus usually closing much sooner than when associated with an osseous process, as one would naturally expect. In the early stages of the involvement of these lymph glands they are discrete, but as the process continues they become matted together, and the products of inflammation fuse large areas of glandular tissue into solid masses. If aggregations of glands thus matted together break down, the course of the abscess may simulate in its duration the course of abscesses derived from osseous foci. Much the same rules hold good for the treatment of abscesses derived from broken down lymph glands as obtain in the treatment of abscesses from tubercular bone lesions. It is very important to prevent them from becoming secondarily infected, and therefore incision should be delayed as long as possible. Aspiration, where they are so situated that this may be done without danger of puncturing overlying or neighboring viscera, is preferable to open incision. If any positive or even strongly presumptive evidence can be adduced to indicate that the glands are isolated and small in number it is possible to resect them through an open incision. This, however, is rarely done, principally because, as a rule, the number of glands is greatly in excess of what might be

anticipated, and too extensive a section of mesentery and intestine would be necessary, and partly of the astonishing capacity for the absorption of these glands which is possessed by the human organism. The writers have observed at operation an abdomen filled with glands in all stages of the process, but for the most part so broken down and matted together that resection was impossible, and the abdomen was closed.

Prognosis.

The prognosis in inflammations of the abdominal lymph glands is good as compared with that of vertebral tuberculosis in the same class of patients. The most serious features of the disease are extension to and involvement of the vertebral column, rupture into the peritoneal cavity, and intestinal obstruction, in consequence of the pressure upon coils of intestine or the matting up of such coils in the products of inflammation. Aside from the gravity of these three complications the outlook for a patient with enlargement of the abdominal lymph glands is comparatively good. Much can be done to favor the prognosis according to the extent to which it is possible to provide efficient treatment and according to the degree to which the patient can be made to appreciate that he has to contend with a tuberculous lesion which requires patience and perseverance second only to that required in the treatment of vertebral tuberculosis.

Case 1.—M. L., male, age twenty-five. May 13, 1902.

One and one-half years ago had pain in back and leg for a short time, but was not confined to his bed. Three months ago a swelling appeared in the thigh. One year ago was seen in the Carney Out-patient Department. At that time he had stiffness of the spine, but no deformity. The lungs were negative on examination. A diagnosis of probable arthritis hypertrophica of the spine was made at that time. He was treated first with a plaster jacket, followed by a leather jacket, and returned to his home in Nova Scotia, where he remained until recently.

Present Examination.—He returned to the Carney Hospital in May, 1902, with an abscess in the right thigh. The circumference of the thigh at the level of the perineum was: right, 24 inches; left, 19 inches. The spinal condition remained unchanged.

There was no apparent knuckle, and no limitation of the hip motion not to be accounted for by the mechanical obstruction. A fluctuating mass extended from the thigh into the pelvis.

On May 14, 1902, the abscess was incised, and between five and six quarts of thin tuberculous pus were evacuated. Drainage was continued. There were daily dressings. The discharge was profuse. Microscopical examination of the granulation tissue of the abscess wall showed it to be tuberculous in character. Nine days later tenderness increased over the trochanter and above the ilium. Pain very great and opiate necessary. Temperature had risen to 105° F. and the pulse to 120. This condition persisted with occasional vomiting, but no irregularity of the bowels until May 31, when the temperature dropped to 99°, the pulse remaining high. The vomiting, diarrhea, and abdominal tenderness increased and the discharge from the wound became thicker in character. He grew rapidly worse and died on the 2d of June.

At autopsy on June 4, the great omentum was found adherent to the pelvic wall at several points. The mesenteric lymph nodes were somewhat enlarged, and upon section presented numerous opaque yellow areas. Two cm. above the ileocecal valve was a marked puckering of the meso-ilium, and in the midst of scar tissue several enlarged and caseous lymph nodes. The left lung showed a small puckered scar on the apex. Liver was normal save for several irregularly shaped yellowish-brown patches on the upper surface of the right lobe. The right psoas muscle had undergone fatty degeneration to a great extent and was extensively occupied by a cavity 3 cm. in diameter, which extended from opposite the first lumbar vertebra to the pelvic brim and contained greenish yellow pus. This cavity was continuous with a retro-peritoneal sinus leading toward the right hip joint. The left psoas muscle contained also several similar abscesses. The bodies of the upper lumbar vertebræ on section showed rough walled cavities, 1 to 2 cm. in diameter, filled with yellow pus. In places these approached the surface of the bone, but there was no direct connection between them and the diseased mesenteric nodes. The disease of the nodes was apparently of longer duration. Microscopic examination of the bone abscesses showed the trabecular walls to be thin and poorly staining. The areas where these had disappeared were filled with leucocytes, epithelioid, and small round cells, granular detritus, and giant cells of the tuberculous type.

Pathological Diagnosis.—Serous abscesses. Tuberculosis of upper lumbar vertebræ. Tabes mesenterica, with constriction of the ilium. Obsolete focus of tuberculosis in the lung.

Case 2.—J. C., male, age 32; machinist. July, 1901.

Three years previous patient had undergone an operation at the Boston City Hospital, when an abscess in the right lower back was incised and a considerable amount of pus was evacuated. The wound closed and there were no further symptoms until three weeks ago, when a swelling appeared in the site of the previous operation. The patient was a tall slim man in fairly good general condition. Above the crest of the right ilium outside the posterior superior iliac spine in the lumbar region was an old cicatrix, bulging from the distension of a deep abscess. There was muscular spasm in the spine on bending to the right, but the other spinal motions were fairly free. There was no bony deformity of the spine. Patient was fitted to a back brace. A few days later operation was performed for the evacuation of this recent accumulation of pus. An incision was made through the old cicatrix, which was tuberculous in character. A deep abscess occupying the right hypochondriac region and communicating with another abscess cavity behind the peritoneum was opened, and about 2 ounces of thick pus was drained off. The wound closed in a short time and remained so, and patient returned to his work. He made routine visits to the out-patient department, and then was lost sight of for some months, and returned the following year in much poorer condition. There was an abscess in the site of the former one, which was easily palpable through the abdominal wall. He had a hacking cough and other signs of phthisis. At a third operation a large amount of pus was evacuated. The discharge persisted. Pulmonary signs increased. There was progressively increasing emaciation, the appearance of a lumbar kyphosis, and six months later the patient died of general miliary tuberculosis, April 25, 1902. There was no autopsy. From the clinical signs this case seems one of glandular disease extending to the osseous structures.

Case 3.—C. L., male, age 19. March 17, 1899.

Two years ago had pain in the lumbar region which disappeared with no recurrence of the symptoms until six months ago, when swelling appeared in the upper right lumbar region a little below the ribs. This was incised and an abscess drained at the Boston City Hospital in February and again in April, 1899. Discharge persisted. Full extension of the right leg was impossible, and patient was obliged to use crutches. A jacket was applied with no improvement. He was sent to the Carney Hospital and laparotomy in the mid abdominal line was performed by Dr. Conant. Careful abdominal exploration showed the entire lower cavity to be filled with glands which forced the intestine into the upper portion. Some of these glands were as large as pullets eggs, and a number were matted together, suppurating and discharging into a sinus in the right lumbar region. A few small caseous glands were removed for examination and shown to be tuberculous, but nothing further was done and the wound was closed. The discharging sinus was enlarged and a secondary opening was made into the abscess formation above Poupart's ligament. The patient was sent home and was visited at intervals for several weeks. The discharge from the two sinuses persisted. Psoas contraction developed, first on one side and then on the other. Both legs became permanently flexed to a right angle, and a secondary sinus appeared in the groin spontaneously. There was marked progressive emaciation, septic temperature, vomiting, etc., and the patient was lost sight of. In 1903 patient appeared for examination. His weight had increased from below 100 pounds to 180 pounds. The sinuses had been closed for several months. Examination showed a perfectly normal abdomen. No psoas spasm. Hyperextension at the hip perfectly free; no kyphos and no limitation of the spinal motions. Patient has since been lost sight of.

He appeared in 1903 to secure a certificate of health that he might get his old position back in the navy.

Case 4.—C. C., male, age 22; shoe factory. December 2, 1901.

Three years ago an abscess formed just above the right buttock, which was opened and drained at the Carney Hospital May 13, 1900. He was discharged on the 13th of June. Condition much improved. The discharge, however, persisted.

When examined in December, 1901, the motion of the left leg was perfectly normal. The right leg was permanently flexed at 45° with much limitation of motion in flexion and extension from muscle spasm. There was also slight atrophy of the right leg. There was a transverse cicatrix in the left inguinal region resulting from old broken down caseous glands, and an abscess had recently appeared on the upper and outer aspect of the right thigh just below the trochanter. There was slight restriction of motion in the lower lumbar spine, and a swelling in the right lower lumbar region. The patient's general condition was good. Patient was admitted to the house, and an abscess in the thigh was incised, curetted, and swabbed out with iodine. Free drainage and irrigation were continued for some time, and the patient was discharged improved to the out-patient department. He was then lost sight of, but reappeared for examination on March 6, 1904. At this time he had been perfectly well for two years. The sinuses about the thigh and lumbar region were all closed and the abdomen was soft on palpation. The motions of the spine and hips were free except in extreme hyperextension, and a deep cord-like thickening persisted near the median abdominal line. An x-ray taken of the lumbar spine at this time showed a perfectly normal condition of the vertebræ, but on either side were small white indefinite patches, most suggestive of old calcified retro-peritoneal glands.

Case 5.—W. H. P., male, age 32; printer. February 9, 1904.

Middle of November 1903 began to have pain in small of back with elevation of temperature (101°). No gastro-intestinal symptoms except constipation. Rest in bed three weeks relieved pain, but five weeks later it reappeared, and had steadily increased until this time. It was referred to small of back, not radiating down legs, and was worse at night, waking patient from sleep, and recently requiring opiates. Better in morning, seldom occurring during day. Examination showed abdomen somewhat resistant to palpation, but not tender. Spine stiff in all motions, especially in forward bending. Patient walked with "military" attitude, carefully guarding all motions of spine, and stepping gingerly.

The red blood count was high, and there was no leucocytosis. X-ray showed no evidence of bony change or thickening about lower spine. Plaster jacket applied. Patient standing, which gave prompt and marked relief. He was discharged February 1904, with all symptoms greatly relieved. Since then up to the present time, June 1, 1904, he has been wearing a leather jacket and is doing his work without discomfort. The x-ray is very suggestive of glandular disease. Spinal motions are still restricted, though not as much so as at first.

Case 6.—M. C., female, age 38; dressmaker. July 8, 1903.

Patient had been previously operated upon for uterine retroversion, without relief, and for 1½ years had been treated for osteo-arthritis with plaster and leather jackets and brace, with some improvement of symptoms. Eighteen months ago noticed stiffness of right leg. For past eight months she had walked lame, and of late there had been a marked increase in pain about the hip. Her appetite was poor, she slept poorly, and had a cough. Upon examination there was found in the right iliac fossa near the median line a deep resistance, firm, the size of an orange, and tender on palpation. There was slight permanent flexion of the left hip, but no shortening or atrophy of the leg. Hyperextension of the left hip was limited, and all the motions guarded. Reflexes present no antero-posterior deformity. Motion was limited throughout the spine and the same was true in the lumbar region to lateral bending. Flexion was accompanied by rotation to the left. On passive motion the spine was found rigid from muscular spasm. She was admitted to the house, where an operation was performed July 10, 1903. An incision 3 cm. long was made above Poupart's ligament, 3 cm. inside the anterior superior spine. An abscess cavity was found in the deep fascia beneath the muscle layers from which one-half pint of greenish pus was evacuated. The abscess cavity lay anterior to the psoas muscle and some distance from the spine. Drainage was continued some time. On August 23 she was discharged from the hospital. There was normal motion in the hip. Anterior posterior motions of the spine were unchanged, but the lateral motion was much improved and the lateral twisting was less marked. No x-ray has been obtained in this case. Present condition is good.

Case 7.—A. J. S., male, age 18; blacksmith. June 24, 1903.

For two years patient had been unable to use his back. Normal motion of the back had been more or less restricted without pain. Two months ago swelling appeared in the lower right lumbar region, which continued tender to palpation. There were no intestinal disturbances. The thoracic examination was negative. Axillary and inguinal glands slightly enlarged. In the right lumbar region was a fluctuating swelling, 6 inches in diameter, extending parallel to and outside the spinous processes in the lower six vertebræ and the sacrum and reaching over the crest of the ilium. The spine was rigid in all directions, evidently from muscle spasm, and hyperextension of the right thigh was limited In the right iliac fossa there was an ana of deep resistance. The patient was admitted to the house and an operation was performed on the 27th of July. Incision was made in the right lumbar region just above Poupart's ligament, and about a quart of greenish-yellow pus was evacuated, much of which was obtained by pressure in the right iliac fossa. On exploration the abscess was found to communicate with a deep cavity by means of a sinus running along the spinal border of the erector spinæ muscle. This cavity was just above and 3 to 4 cm. posterior to the right anterior superior spine. The wound was drained, and on the 6th of August the patient was discharged wearing a jacket. The spinal motions were at this time guarded, but much freer above the lumbar region. On September 14, 1903, he re-entered the hospital with the history of the formation of a similar tumor to the left of the vertebral column, where a fluctuating swelling the size of an orange was palpable. Abdominal palpation was unsatisfactory on account of the marked muscular rigidity. The old sinus in the right lumbar region was still discharging. On September 18, an operation similar to the first was performed in the left lumbar region, and 1½ pints of pus were evacuated, much of which escaped upon deep abdominal pressure. A similar deep connection was found in this case also. He was discharged on September 23, his general condition much improved, and wearing a leather jacket. Following this operation his general condition improved gradually, and he gained 22 pounds in weight. On March 6, 1904, he appeared for examination. Six weeks previously there had been an acute damming up of the left lumbar abscess, accompanied by a severe chill and fever continuing for three or four days, the temperature reaching 104° F. No vomiting or other intestinal symptoms. Appetite fair. Since then marked pain in the legs and in the left hip near the sciatic notch had persisted without localized tenderness on palpation. He had recently lost several pounds in weight. When examined he stood with considerable lordosis and slight lateral deviation to the right in the lumbar region. The lumbar spine was very rigid, especially in flexion. His spinal motions were all very guarded; there was no kyphos, and his color was fairly good. Abdominal examination showed marked rigidity, especially over the lower epigastrium and in both hypochondriac regions. The abdomen was also somewhat distended and tympanitic. An x-ray taken at this time showed no bony lesion in the lumbar region, but several distinct nodular areas, strongly suggestive of calcified lymph glands.

When seen on May 20, 1904, there was no kyphosis. A very large abscess was developing in the left thigh and the old sinuses were discharging very slightly. General condition, in spite of suppuration, improving.

Is now in the hospital for drainage of the thigh abscess.

Case 8.—M. T. O'B., male, age 27; dairyman. June 11, 1903.

Six months ago first noticed weakness in the back. Pain especially on moving, and not worse at night. There had been no previous trauma. Symptoms increased gradually, and in April he stopped work. Was seen at the Massachusetts General Hospital, and a plaster jacket was applied. Six months later another jacket was applied at the Carney Hospital. Two months ago he first noticed swelling in the right groin. No history of abdominal pain or tenderness, vomiting, or diarrhea.

Patient was a well built and well nourished man. The thoracic examination was negative, as was the abdominal, save for the right iliac fossa. Here there was a palpable tumor chiefly above Poupart's ligament, the size of a large orange, oval in shape, and extending upward into the lumbar region. Not tender to pressure. The spine showed no deformity but was quite rigid. On active motion no forward, but slight lateral bending was possible above the seventh dorsal. Hyperextension of the right thigh was not allowed. The spinal spasm was marked. No signs of paralysis in the extremities. Right leg 1.5 cm. shorter than left. He was admitted to the house, and an operation was performed on June 15. Through an incision parallel to Poupart's ligament 4 cm. long an abscess was located beneath the fascia under the internal oblique. On opening this 20 ounces of cream-like pus was evacuated. The cavity on exploration was found to extend behind the peritoneum well up into the lumbar region. The wound was drained, and on July 8 the patient was discharged from the hospital. At that time there was slight discharge from the wound. There was an infiltrated mass the size of a pigeon's egg about the sinus. The motions of the spine were free laterally, but rigid anteroposteriorly. On March 6, 1904, patient appeared for examination. His general condition was excellent. He suffered no pain, but his back was still somewhat weak. He stood erect with the lumbar curve obliterated. There was no lateral deviation of the spine and no kyphosis. The motions of the lumbar spine were restricted in all directions, but especially in forward bending. The sinus in the right groin which closed three weeks after the operation had not reopened. On abdominal examination the recti muscles were found to be quite rigid, and in the upper half of the abdomen was to be felt a deep resistance which was entirely absent in the lower portion above Poupart's ligament. This resistance suggested a glandular mass in the right hypochondrium. An x-ray taken at this time showed a destructive process in the last lumbar vertebræ with no signs of calcified retro-peritoneal glands in the lumbar region. Patient had been wearing a jacket continuously.

Case 9.—Mr. W. B., 18 years.

History good. A year and a half ago had pneumonia, which was tardy in resolving. In April, 1902, had considerable pain referred to his back which kept him in bed two weeks. This was referred to the lower part of the back and groin. He then went to work, but back pained him more or less constantly during the succeeding year. For past three months has had considerable pain referred to the perineum, which led to a diagnosis of tuberculosis being made at the Massachusetts General Hospital. He has had no trouble with the back for the past two or three months. Motions of the spine are somewhat limited and it has been somewhat difficult for him to put on his shoes. Of late has been having considerable pain in the right groin and down the right leg. This is worse when standing; in fact, except very recently, he has had no pain at night when recumbent.

Examination.—Slender, poorly developed boy, with straight spine; motions limited both in flexion and lateral bending; side bending is more free to passive motion than active. No abdominal resistance or tenderness; hip and knee motions free. Condition suggests at this time, September 23, 1903, a retroperitoneal glandular tuberculosis, or an osteo-arthritis. Leather jacket fitted and worn until May 29, 1904. Has been out of doors practically all winter. General condition has much improved.

Four months ago began to have trouble with the left ankle; pain; limp. There have been one or two remissions, but at present the condition is worse than at any time previous. Spinal conditions practically the same as at last note. About four of the low dorsal and lumbar vertebræ being restricted. In the right iliac fossa is an extensive tumor mass, either broken down glands or a psoas. This extends up along the side of the iliac bone and not toward the median line. Ankle much swollen, and motions are restricted in all directions by muscular spasm. X-ray of the ankle shows extensive tuberculous disease of the astragalus; x-ray of the spine shows that the vertebræ are entirely clear, and give evidence of masses of lymph nodes on either side of the vertebral column.

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IX.

THE TREATMENT OF ROUND SHOULDERS BY FORCIBLE CORRECTION.

ROBERT W. LOVETT, M.D., BOSTON.

That certain very marked cases of round shoulders are resistant to gymnastic and mechanical treatment is a matter of common information. The present paper is an attempt to present a method of treatment which, in the writer's hands, has produced improvement in cases of the resistant type which had been, for the most part, for many years under gymnastic or mechanical treatment without marked benefit. The method used was forcible hyperextension of the dorsal spine with forcing back of the shoulders, and while the patient was held in the corrected position a corrective plaster jacket was applied embracing the shoulders. Ether was not used. Six cases are reported from the out-patient department of the Children's Hospital and one from private practice.

The method and apparatus used were similar to those described by the writer for the application of plaster jackets in Pott's disease.

The apparatus consists of an oblong gaspipe frame of the ordinary pattern. Fastened to this near the middle and hinged so as to be raised to any degree is another section of gaspipe lying on the frame proper and of the same shape and size as the upper half of the frame. To this movable section is fastened at right angles to it and movable on it a gaspipe bridge rising about 18 inches from the movable section.

When prepared for use two strips of webbing, lying one over the other, run from each of the buckles at the bottom of the frame. The lower pair of these strips are tightly drawn and run to the buckles at the end of the movable section. The upper

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Presented at the Eighteenth Annual Meeting of the Association, Atlantic City, N. J., June 8–10, 1904.

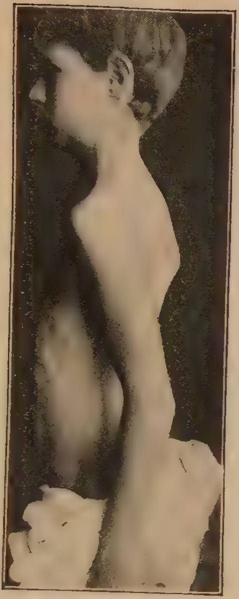


Fig. 1.—Patient before Correction.

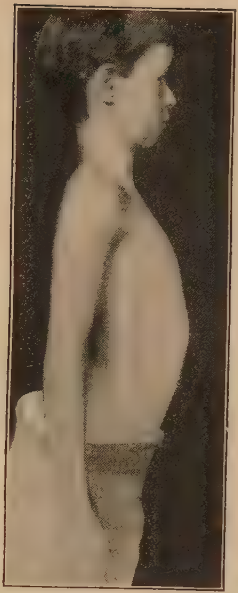


Fig. 2.—Patient after Correction.

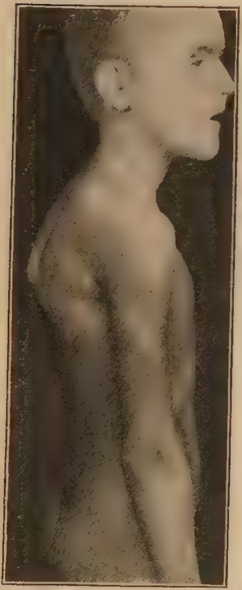


Fig. 3.—Patient before Correction.

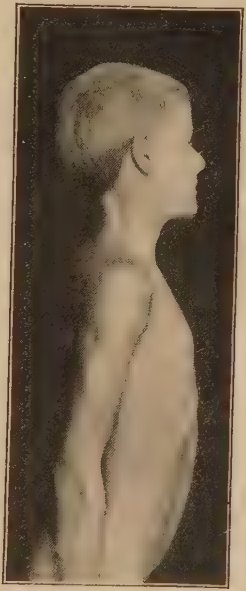


Fig. 4.—Patient after Correction.

pair are loosely fastened to the bridge over the movable section.

The cross-pieces are tightened and the patient laid face downward on the webbing strips, which may if desired have laid over them a folded piece of sheet wadding. The strips, however, even in adults, are not uncomfortable.

The thighs are flexed and the feet rest on the floor so that the lumbar spine is flattened. Two pieces of webbing are passed over the mid-dorsal region from side to side tied to the lower non-movable frame on each side. These furnish the resistance for the straightening of the spine when the upper end of the frame is lifted carrying with it the head and upper chest. The upper part of the frame is lifted after the patient is in place and as much force as seems advisable is exerted. It has never been pushed beyond the point of mild discomfort. Several

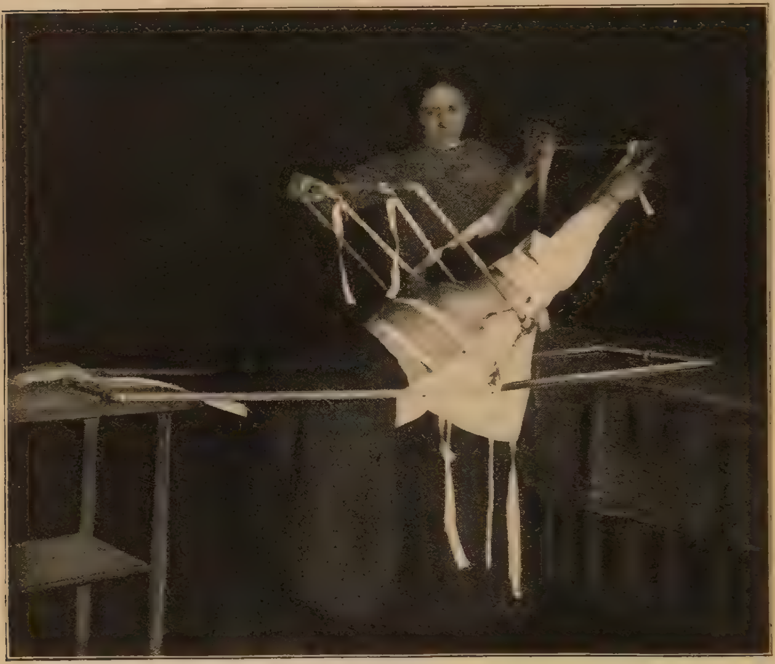


Fig. 5.—Corrective Apparatus in Use.

stretchings have first been made of a few seconds each and the movable part of the frame again let down to rest the patient. The movable part of the frame is finally raised and fastened in place and a plaster jacket applied. This has been worn for three or four weeks when it has been replaced by a brace and corrective exercises have been again begun. The brace used has been some modification of the tempered uprights in common use.

In one of the later corrections, a severe case of round shoulders and bowing of the dorsal spine, it was noted that the preliminary stretching apparently straightened the dorsal curve and a tracing taken showed that to be the case.

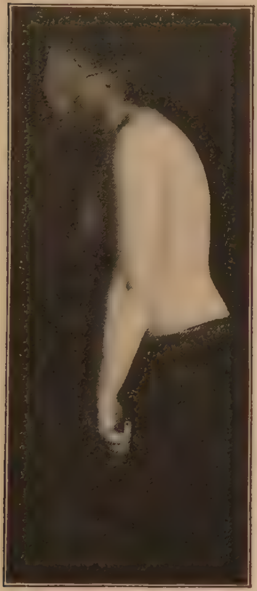


FIG. 6.—PATIENT BEFORE CORRECTION.

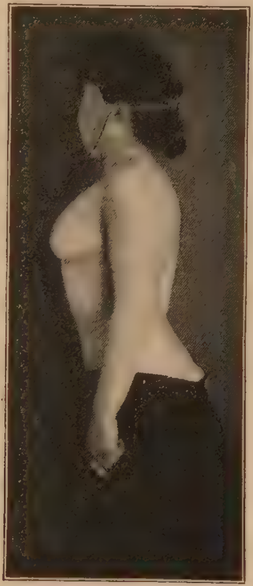
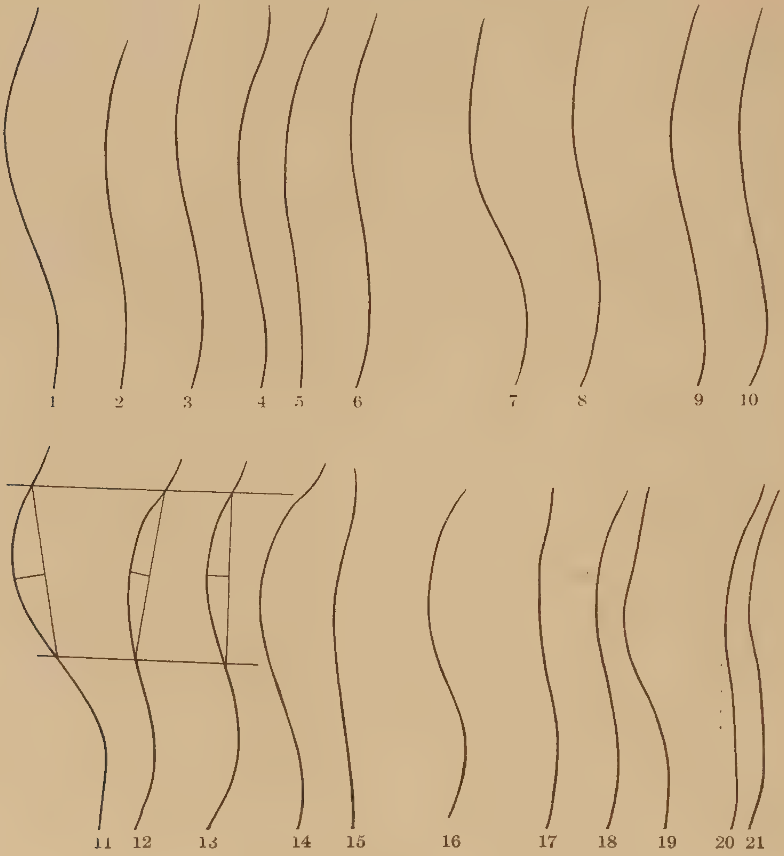


FIG. 7.—PATIENT AFTER CORRECTION.

The fact that temporary forcible stretching might produce improvement was therefore utilized in the treatment of a patient in private practice where it was not practicable to apply a plaster jacket.

A young woman of eighteen, a school teacher, came for the treatment of round shoulders and bowed spine, both of which had existed for many years, which was a source of mortifi-



Tracings of the Spine in Four Cases.

1. Standing before correction. 2. Standing after correction, one month later. 3. Standing after correction, six months later. 4. Lying before correction. 5. Lying after correction. 6. Lying after correction, six months later. 7. Standing before correction. 8. Standing before correction, four months later. 9. Lying before correction. 10. Lying after correction, four months later. 11. Standing before correction. 12. Standing ten minutes after correction. 13. Standing after removal of jacket. 14. Lying before correction. 15. Lying after removal of jacket. 16. Standing before correction. 17. Standing after removal of jacket, five days later. 18. Standing six months later. 19. Standing six months later. 20. Lying before correction. 21. Lying after correction.

cation to her as it was so marked as to be very noticeable, even with her clothes on.

The spine was stretched, by the method described, at intervals of a few days and the photograph shows the result of eight stretchings covering a period of less than a month. In each photograph the natural attitude of standing was assumed. The improvement has been retained and the patient is now on gymnastic work. After the first one or two treatments slight lameness was experienced.

The other cases have all been treated with jackets to retain the improved position gained by stretching and this is the only case in which I am able to speak of forcible stretching without support.

In the cases wearing jackets, which always included the shoulders, the progress was uneventful and not especially uncomfortable except in one case who developed a moderate paralysis of the left arm, affecting chiefly the muscles supplied by the median nerve. This apparently was due to the pressure of the plaster shoulder piece on the nerves in the brachial plexus. The paralysis recovered without treatment. The tracings taken from these cases show a real straightening of the dorsal spine in addition to the pulling back of the shoulders.

The corrective jackets were worn for three or four weeks in most cases and replaced by tempered steel uprights holding the spine extended, in connection with gymnastic exercises performed daily.

The present condition of the patients has been investigated with a view to determining the permanence of the results obtained, and the tracings of some of them are shown. They are all better than before the correction but not quite as well as immediately after it. One case corrected in November disappeared soon after it and has had no treatment in the interval. In May his tracing and photograph showed that he had retained a large part of the improvement gained by his correction.

It must be remembered that they were with one exception hospital out-patients, irregular in attendance and not under favorable conditions so far as continued treatment is concerned.

The ordinary gymnastic exercises and manipulations are satisfactory in the treatment of round shoulders of mild degree and in young children. But where the deformity has lasted for years the pectoral muscles have become shortened and the scapulæ are held forward by general contraction of the tissues. The scapulæ are movable enough to escape from any attempt to force them into place unless the force is carefully localized and of sufficient degree to be effective.

From the lever force described, accurately applied, there is no escape and it becomes simply a question of how much correction is safe.

It would seem that some such mechanical stretching, whether or not followed by jackets, is a desirable measure in the treatment of severe round shoulders. All that one can hope from it is to restore to the dorsal spine a more normal range of hyperextension and then to educate the muscles to retain the improved position.

X.

AN IMPROVED APPARATUS FOR THE TREATMENT OF THE DEFORMITY OF HIP JOINT DISEASE BY WEIGHT AND PULLEY EXTENSION.

ALBERT H. FREIBERG, M.D., CINCINNATI.

In cases of coxitis which are still active, I believe there is no method which is more satisfactory or in more general use than that of traction by weight and pulley in the line of deformity. For my part, the reduction of deformity by repeated plaster-of-Paris spicas is never one of choice but finds its application only where the ambulatory treatment must be carried out.

However, I have found no little difficulty in maintaining a proper adjustment of the apparatus in hospitals, especially when the degree of flexion and abduction are great. It has been a frequent experience with me, that nurse or even house surgeons fail to keep the inclined plane and the pulley in their proper relations. This is especially likely to be the case since in most forms of the apparatus several adjustments must be made in two or even three separate pieces.

Having had rather a larger number of this kind of cases this winter than usual, my intern at the Cincinnati Hospital, Dr. Howard Johnson, devised an apparatus which was to be of easy application to the usual hospital bed and in which the relation of pulley and inclined plane should be constant and changeable by means of one adjustment for both. Dr. Johnson therefore, had constructed in wood an apparatus embodying these characteristics and in which some ideas of my own were incorporated. In making the adjustment for abduction and adduction, it is however, desirable that the pulley shall turn on its vertical axis with the inclined plane, so that when the

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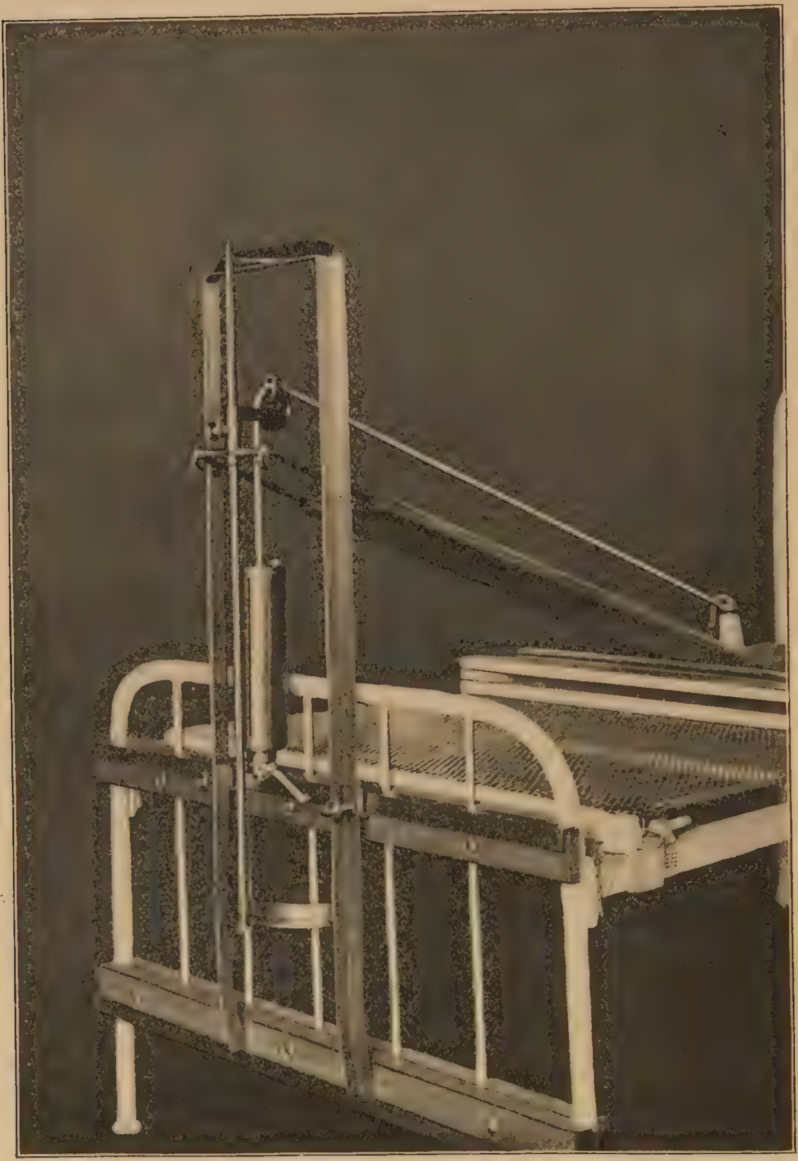

WEIGHT AND PULLEY APPARATUS APPLIED TO BED.

angle is considerable, the pull may be direct and with a minimum of friction.

At this juncture, the superintendent of the hospital, Mr. John Fehrenbatch came to our aid with his ingenuity and experience, and added several desirable features to the apparatus which may now be constructed entirely of metal. He has made it possible for the pulley to be always in line with the inclined plane. The adjustment for abduction or adduction is made at the bottom of the bed by means of thumb screws and in making it no attention need be paid to the inclined plane. Very ingenious, although not necessary to the working of the apparatus, is the weight which Mr. Fehrenbatch devised and which may be made heavy or light by means of shot contained in a hollow cylinder. He has also made it possible to fix this weight at any part of the rope without a knot by means of an ingenious device. This weight naturally adds to the expense of the apparatus and may be dispensed with. For hospital purposes, it should be possible to manufacture the apparatus without the weight for ten dollars. It could also be made partly of wood, somewhat cheapening the expense in this manner. In practice the apparatus has been found to work admirably. It is used in conjunction with the Bradford frame and because of the admirable immobilization and the possibility of very gradually diminishing the angle, it appears to me to dispose of the deformity more rapidly than has been the case heretofore.

DISCUSSION.

Dr. Judson stated that he had found it convenient in some cases to fasten a pulley to the wall of the room at a suitable height. With such an arrangement, by rolling the patient's cot away from the wall to reduce the angle, the flexion was reduced as the cot was carried further and further away from the wall. In the same way lateral adjustments can be made by movements from side to side. It has been found extremely useful in the case of painful joints resenting disturbance.

ABSTRACTS.

SPINE.

294. **Kümmell's Disease of the Spine.** By Brodnitz. *Zeitschrift orth. Chir.*, XII Band, 1 und 2 Heft.

Kümmell in 1891 described a disease of the vertebræ in which after more or less irritation, a rarifying process takes place in the bodies, the end-stage being a loss of substance and a distinct gibbosity.

Writer reports a case of contusion of the spine, in which eight weeks after the injury, the Röntgen-ray showed normal vertebræ, but in which, at the end of another two months, a fusion of the bodies could be demonstrated in Röntgen-pictures.—*Henry O. Feiss, Cleveland, Ohio.*

295. **Some Experience with Pott's Disease.** By E. E. Armstrong, M.D., Sylvania, O. *Cincinnati Lancet-Clinic*, Aug. 27, 1904, vol. liii, No. 9.

Pott's disease is liable to occur in practice before development of the spinal deformity, and may be marked by abdominal pain, relieved only by the prone position, emaciation, and fast pulse with little or no fever. In an illustrative case of a girl 22 years old, who for one year had suffered abdominal pain which, without relief, had been given gynecological treatment, and who for three months had been confined to bed, examination discovered "over the tenth dorsal vertebra a small bony tumor, which by manipulation caused a speedy recurrence of the abdominal symptoms and a tingling sensation in the lower limbs, rapid breathing with feeling of impending death." Hysteria was considered, and reference is made to Nothnagel's statement that "the spleen and pancreas (whose function may have been disturbed in this case) when diseases are largely the cause of the train of symptoms we have for so many years called hysteria." Two weeks after application of a plaster jacket under Sayre suspension, the patient began to walk without symptoms. After five months, instead of one year as advised, jackets were abandoned, as the patient could walk, ride, and bend with no return of symptoms. This freedom from symptoms has continued for years. The small bony tumor over the tenth dorsal vertebra is not further mentioned.

A carpenter, 29 years old, had had symptoms for two years and paraplegia confining him to bed for twelve weeks. Kyphosis of tenth to twelfth vertebræ half the size of a cocoanut. Upon being suspended for the first plaster jacket, "the fellow declared he could feel his feet well, and that the tingling had disappeared." After three weeks in bed wearing the jacket, he began to walk with crutches, and "exercised by lifting himself to a crossbar each day, which same he enjoyed because of relief." In eight months, he was walking without canes, and in seventeen months, discontinued jackets, and is free from pain and can do light work.

A nourishing diet is advocated. On account of the underlying systemic tuberculosis, perfect health is not to be expected and the caries may recur.—*William E. Blodgett, Detroit, Mich.*

SCOLIOSIS.

296. **Relations Between Cervical Ribs and Scoliosis.**—By Carl Helbing. *Zeitschrift orth. Chir.*, XII Band, 1 und 2 Heft.

A scoliosis in the lower cervical and upper dorsal region has been noticed in all cases of cervical ribs seen in Hoffa's clinic. There were 13 cases. They all present the same picture. Such material as could be gathered from other clinics shows the same thing.—*Henry O. Feiss, Cleveland, Ohio.*

297. Experience as to the Value of "Orthopedic Corsets." By Bade· *Zeitschrift fur orth. Chir.*, XII Band, 1 und 2 Heft.

Has handled 187 scolioses in three years; 70 of these had braces; 23 of the 70 had forcible redressment. These 23 showed the best results. A brace described in which a rubber bag filled with air is used as pressure. Writer says a powerful pressure may be exerted in this way. The trouble is that the air leaks out too quickly. Another brace described built on the model of the Beely-Hoffa frame.—*Henry O. Feiss, Cleveland, Ohio.*

HIP—(a) Coxa Vara.

298. Coxa Vara. The Static Deformity of the Neck of the Femur. By A. Schanz. *Zeitschrift fur orth. Chir.*, XII Band, 1 und 2 Heft.

In the etiology we find either a falling off in the static capacity for weight bearing of the neck, or an increase in the static requirements.

In the first class we include coxa vara rachitica, osteomalacia, post inflammatory, post traumatic and the coxa vara of morbus coxæ senilis.

In the second class we include the occupation affections, viz.: cheesemakers, bakers, etc.

Congenital coxa vara and that of severe rickets do not come under these heads. The former is due to extreme intra-uterine pressure. Discussion of these theories. If we look upon the deformity from this point of view, we have definite indications for treatment.—*Henry O. Feiss, Cleveland, Ohio.*

299. The Relation of Congenital Coxa Vara to Congenital Defect of Femur. By Max Reiner. *Zeitschrift fur orth. Chir.*, XII Band, 1 und 2 Heft.

Three types of defect of femur each of which represent a fixed stage in one and the same deforming process.

These are:—

1. Femur reduced in actual length and thickness.
2. Femur is sprung apart in various places. Distal end articulates with tibia as a normal knee joint.
3. Like Type 2 but knee joint abnormally developed.

Congenital coxa vara is an antecedent step in that deforming process which in its end stage leads to Types 2 and 3 of the so-called congenital femur defect.—*Henry O. Feiss, Cleveland, Ohio.*

300. Coxa Vara Resulting from Early Rachitis. By Michael Cohn. *Jahrbuch f. Kinderheilkünde*, N. F., 58, Heft 3. Abstract *Archiv. für Orthopedie, Mechanotherapie und Unfallchirürgie*, Band II, Heft. 11.

Coxa vara is defined by Cohn, as a "bending downward of the neck of the femur so as to make the angle between the neck and the shaft more acute." The projection of the greater trochanter above Nelaton's line is of no value as a diagnostic sign as it is often to be found in absolutely normal infants. From relaxation of the ligaments these cases allow of an excessive amount of external rotation of the thigh; this in combination with the loss of internal rotation are valuable diagnostic signs. Kirmisson has pointed out that a strongly bowed shaft of the femur may simulate coxa vara. Extreme deformity is rarely observed and a goodly amount of the bending as shown postmortem, may have given rise to no signs during life.—*Walter G. Stern, Cleveland, Ohio.*

301. Coxa Vara. By Fritz Harting. In *Muenchener Med. Wochenschr.*, June 28, 1904.

Attention is called to the work of Alsberg in the measurement of the angles formed by the junction of the neck with the shaft of the femur. Alsberg's "Richtungswinkel" is the angle formed by the intersection of a line passing through the center of the femur with one passing through the distal edge of the cartilage on the head of the femur. This angle varies from 25° to 54°, the average being 41.15°; any case measuring less than 25° is to be considered one of coxa vara. The deformity may be so great as to make this angle a negative one.

The predisposing causes of coxa vara are rickets, osteomalacia, osteo-myelitis, tuberculosis, arthritis deformans, ostitis fibrosa and trauma—especially fractures of the neck of the femur. The active cause is the static burdening of the afflicted part. Harting defines coxa vara as a static deformity caused by the weight of the body being borne on the upper end of a femur weakened by one of the above mentioned causes.

A few of the symptoms of coxa vara, lordosis, prominence of the buttocks and trochanters, and Trendelenburg's "Adduction Gait" are also seen in congenital dislocation of the hip.

In the active inflammatory state rest, extension, massage and passive motion are indicated. In old cases Hoffa's operation of subtrochanteric osteotomy is strongly advised.—*Walter G. Stern, Cleveland, Ohio.*

302. The Etiology of Nonsymptomatic Coxa Vara.—By Froelich. *Zeitschrift fur orth. Chir.*, XII Band, 1 und 2 Heft.

At the present time we have come to describe a symptomatic and an essential coxa vara.

The symptomatic type presents usually an hypertrophy of the neck and the angle is very close to the trochanter major. In the essential type the neck is seldom hypertrophied and the angle is close to the head.

Report of three cases of the essential type. In each a specimen was obtained for bacteriological study. In two of them staphylococci were found.—*Henry O. Feiss, Cleveland, Ohio.*

303. Etiology of Curvature of the Femoral Neck. Joachimsthal. *Zeitschrift fur orth. Chir.*, XII Band, 1 und 2 Heft.

Various diseases may lead to various deformities of hip. May be congenital, in which case it is intra-uterine in its origin. Characteristic of this type is the long-drawnout cylindrical head which is attached almost directly into the shaft.

There is a less typical form of congenital curvature of the neck, which is related to congenital defect of the femur. Review of cases: Report of a case, shortening of femur, noticed at four weeks. X-ray showed no center of ossification at upper epiphysis. The proximal end of the femur is conical and appears luxated upward on pelvis. At 2½ years left femur is one-half as long as right. Upper epiphysis is lacking. At 3¼ years the skiagram showed the beginning of a head at the acetabulum. Later connection between head and diaphysis takes place. We have to deal therefore with a retardation in ossification.

In curvatures of extra-uterine life, rachitis is an important cause. The static form of coxa vara. The traumatic form. Tuberculosis, osteo-myelitis and arthritis deformans as factors.—*Henry O. Feiss, Cleveland, Ohio.*

304. Treatment of Coxa Vara. By A. Codivilla. *Zeitschrift fur orth. Chir.*, XII Band, 1 und 2 Heft.

The writer believes that in the surgical treatment the osteotomy should be done at the neck, the seat of the deformity, that no substance should be lost and that it should be done outside the coxo-femoral joint.

The soft parts should be correspondingly lengthened. In the operation the neck is severed from the shaft by a semicircular cut, with the concavity toward the pelvis. By properly placing the limb in abduction, the abductors are lengthened. Traction also used. Method tried in 3 cases. In 2 of them good results are already in evidence.—*Henry O. Feiss, Cleveland, Ohio.*

HIP—(b) Congenital Dislocation.

305. Apparatus in the Treatment of Congenital Dislocation of the Hip. By Heusner. *Zeitschrift fur orth. Chir.*, XII Band, 1 und 2 Heft.

1. A brace holding leg in adduction and inward-rotation consisting of a leather corset from which a spiral spring including the whole leg runs down to the shoe—the spring working in the proper directions.
2. Osteoclast used in reducing the hip. Its chief end is to fix the pelvis. For holding it snugly the copper plates clamping the pelvis are made from plaster impressions. The clamps are approximated with screws. A fixation-plate is placed behind trochanter as a fulcrum for jacking in the head.—*Henry O. Feiss, Cleveland, Ohio.*

306. Treatment of Congenital Hip Dislocation. By Schultze. *Zeitschrift orth. Chir.*, XII Band, 1 und 2 Heft.

Writer's method after reduction, consists in applying plaster in usual method, but removing same finally after ten days, using a specially constructed reclination-bed. The entire after-treatment is carried out upon this bed. Construction is such that only the thigh and leg in question are fixed.—*Henry O. Feiss, Cleveland, Ohio.*

KNEE.

307. Epiphyseolysis with Subcutaneous Periosteotomy in the Correction of Genu Valgum Infantum.—By Max Reiner. *Zeitschrift fur orth. Chir.*, XII Band, 1 und 2 Heft.

With an instrument for the purpose, the entire lateral side of the periosteum is divided at the junction of the epiphysis to the diaphysis of the femur. The operation is done subcutaneously on outer side of the leg. Correction of the deformity is now carried out and the epiphysis parts at the point of operation.—*Henry O. Feiss, Cleveland, Ohio.*

FOOT.

308. Correction of Congenital Club-foot in Adults.—By Ernst Mayer. *Zeitschrift fur orth. Chir.*, XII Band, 1 und 2 Heft.

Report of a case of a man fifty years old. In the first operation manual redressment and division of plantar-fascia. In the second, supination and adduction corrected by Stille-Lorenz osteoclast. In the third the equinus corrected by dividing tendo achillis. At the end of eight to nine months, patient's foot in good position and not using a brace.—*Henry O. Feiss, Cleveland, Ohio.*

309. New Apparatus for Treating Club-foot. By Heusner. *Zeitschrift fur orth. Chir.*, XII Band, 1 und 2 Heft.

1. A modification of a ring-lever for forcible correction, reported last year.
2. In the after-treatment after the plaster stage, the "redression" spring is used which is fastened to the soles of both shoes and works in the pronation direction. If it is a single case, a stout boot must be placed on the well foot, reinforced against undesired influence.—*Henry O. Feiss, Cleveland, Ohio.*

SHOULDER.

310. Bilateral Congenital Elevation of the Scapula. By Karl Hirsch. *Zeitschrift fur orth. Chir.*, XII Band, 1 und 2 Heft.

Only 7 previous cases reported. Age one year eight months. Head seems to lie directly on chest and is tipped backwards and to the right. It is held stiffly and fixed. All motions sharply limited. Sterno-cleido-mastoid only palpable on left side. Form of head is brachycephalic. Lower back edge of occiput in relation to seventh cervical spine. Expression of face not perfectly intelligent. Eyes show convergent strabismus. Angle of left scapula at height of second dorsal vertebra. Angle of right at height of third. Both are shifted far outward. Neither abnormally fixed. A review of the literature.—*Henry O. Feiss, Cleveland, Ohio.*

TENDONS AND MUSCLES.

311. Tenodesis, a Form of Partial Arthrodesis. By Max Reiner. *Zeitschrift fur orth. Chir.*, XII Band, 1 und 2 Heft.

The operation consists in fixing paralyzed joints in proper positions by fastening the proper tendons to the bones, as, for example, in paralytic equino-varus, the foot is first corrected and the slack taken up by stitching the peronei to the fibula, so that it acts as a ligament. Writer thus does away with the stiff joints following arthrodesis.

A modification consists in using silk thread instead of tendon and fastening it from bone to bone. This becomes a basis for a future ligament.—*Henry O. Feiss, Cleveland, Ohio.*

312. Tendon Transplantation. By F. Lange. *Zeitschrift fur orth. Chir.*, XII Band, 1 und 2 Heft.

Lange's aim has been to get functional independence in transplanted muscles. According to his experience it is only in the case of the tibialis anticus that the portion split off learns to functionate after a period of inactivity. So, instead of splitting he tried transplanting whole muscles. But this also did not always give functional independence to the transplanted ones. He avoided as much as possible separating from each other, muscles which worked the same way because then they would counteract each other. The fewer the muscles left the more important it is that these should functionate. The importance of the periosteal method for severe cases, on account of the advantage of the periosteum as the attachment point. In spite of all advantages of this method, it would have very limited application in actual practice as many muscles are too short. Hence in many cases the transplanted muscle must be lengthened by silk sutures. There are three chief points to look out for: (1) Tension decubitus; (2) knot-decubitus, and (3) thread-abscess.

Specimens described showing that actual tendon tissue forms about and throughout the silk thread.—*Henry O. Feiss, Cleveland, Ohio.*

313. Experience with Tendon and Muscle Transplantation. A Schanz. *Zeitschrift fur orth. Chir.*, XII Band, 1 und 2 Heft.

The writer has tried to use the least complicated plans. He prefers long incisions to short ones.

In the transplantation he splices the two tendons together, before uniting them with sutures. For the sutures, aluminum bronze wire is used, which he finds more aseptic than silk. This wire becomes surrounded with new tendon.—*Henry O. Feiss, Cleveland, Ohio.*

314. Importance of the Pathologic Anatomy of Muscles in Tendonplastic for Spinal Paralysis. By Jos. Koch. *Muenchener Med. Wochenschr*, July 19, 1904.

Such muscles react by a fatty degeneration of their contractile substance, which degeneration can vary from a part of a single muscle fibre to the complete substitution of a muscle bundle with fatty tissue. Microscopic examination has shown that when this degeneration is scattered throughout a muscle in smaller areas, a large amount of regeneration of the muscle fibres will take place in each area; but where the entire muscle has been transformed into fat, no regeneration takes place. This regeneration occurs some time after the paralysis and fatty degeneration, the latest being seven to nine months.

The elastic tension and muscular tone are both lost through this fatty metamorphosis; and both being essential to the normal contraction of a muscle, it is possible that a complete regeneration may take place and still the muscle be unable to resume its function. These lost factors must always be restored operatively by tendon shortening to give the best possible results.

The color of a paralyzed muscle red, pink or yellow, depends upon the amount of fatty degeneration and its substitution through regenerated muscle fibres; all three colors may be seen in one muscle. The experience in Hoffa's clinic has shown that little reliance can be placed in the macroscopic appearance to determine whether or no a given muscle is fit to be used for tendon grafting. This is especially true of the quadriceps extensor only a small portion of which can be examined in the usual incisions. Where tendons do not reach to the desired insertion they can be successfully substituted by silk strands.—*Walter G. Stern, Cleveland, Ohio.*

315. Present Status of Tendon Transplantation. By Vulpius. *Zeitschrift fur orth. Chir.*, XII Band, 1 und 2 Heft.

1. Tendon Lengthening.—Simplest means for lengthening is tenotomy. This interests us from the point of view of healing. The end-result shows that the tendon sheath is not quite as sharply defined as usual, the mirror-like gleam is lacking; in short it shows cicatricial changes.

Plastic Methods.—First, the step-incision of Bayer and its modifications. Lengthening the tendon at its muscle attachment. Nicking the side of the tendon. Lengthening by silk sutures. Hoffa has shown the importance of hemorrhage and infection in influencing the healing process. Indications for operation. Results excellent.

2. Tendon Shortening.—Technique various ways: Results are excellent, and consist in a return of function in cases of atrophy due to overstretching.

3. Tendon Transplantation.—Several methods: Either we freshen the paralyzed and healthy tendons laterally and sew them together, or we make total transplantation; we use a totally healthy tendon to replace the paralyzed one, *i. e.*, function transference. A third method is the partial transplantation wherewith we only use part of the healthy tendon and unite it with the paralyzed one. The latter, too, may be treated in various ways; it may be totally cut off and brought up to the healthy tendon, or we may do the same with a part of the paralyzed one or finally we may leave the same intact.

Modifications: Periosteal method. Two advantages:—

1. The paralyzed tendon gradually gives way so that the thread becomes lost. Therefore safer to fasten the tendon directly into periosteum.

2. The periosteal transplantation permits a selection of points for insertion.

Advances of Wolff, Muller, Mainzer, Lange.

A review of the after-treatment. Indications. Results.—*Henry O. Feiss, Cleveland, Ohio.*

316. Experience in Tendon Transplantation. By A. Codivilla. *Zeitschrift fur orth. Chir.*, XII Band, 1 und 2 Heft.

Experience based on 156 cases and 250 operations from May, 1899, to May, 1903; although not all were pure transplantations, but they all had the same object, that of distributing the power equally about the joint. He had one death, and suppuration occurred three times. The return of the deformity after removal of plaster occurred four times. End results: 164 cases: 92 good results, 57 satisfactory, in 15 more or less recurrence.

The best results occurred in infantile paralyses where the trophic disturbance is confined to the foot muscles, causing equino-varus. Good results were obtained also in valgus and calcaneus.

On transplanting, the end of the tendon is cut obliquely and passed through a hole made in the second tendon and stitched in place.

In shortening or lengthening, the oblique method is used.

For paralysis at the hip joint the round ligament may be shortened to good advantage.—*Henry O. Feiss, Cleveland, Ohio.*

317. The So-called Ischemic Paralysis and Muscular Contracture. By H. Schramm. *Wiener Wochenschr.*, 1904, No. 27, July 2.

But 26 cases of this rare condition have been described in European literature within the last fifteen years; 19 cases occurred in children under the age of eighteen years. The cause in most cases was fracture of the lower end of the humerus or the upper end of the ulna or radius and the early application of a tight-fitting splint or plaster cast. One case was caused by severe contusion of some of the flexor muscles, and another by the long continued application of an Esmarch bandage. The symptoms come on almost immediately, the hand and fingers become cold, blue and swollen; and in a few hours contract. When the bandages are removed blisters or necrotic areas are noticed where the pressure of the bands has been too great. These symptoms soon disappear, excepting the contractures which constantly increase until often the nails of the fingers are firmly embedded in the palm of the hand. Active and passive motion are absolutely impossible in severe cases. Later on the forearm atrophies, the growth of the bones is retarded and the muscles feel like small hard strands.

The pathology of this condition is not yet known. The cases fall into three groups: I, Where the condition is doubtless caused by lack of proper circulation; II, cases where there is a traumatic inflammation of the muscle; III, cases due to nerve lesions. These three conditions cannot always be differentiated. Volkmann contends for the ischemic theory, and likens the process to rigor mortis. The early appearance of the paralysis of the extensors and flexors, and the immediate contractures in the flexor muscles give weight to his argument.

The diagnosis is generally not difficult, the early contractions ruling out radial palsy, infantile paralysis and the like.

Up to the present decade the prognosis has been grave, and the treatment merely an expectant one. The treatment should, however, be the same as for any other paralytic deformity, tenotomy, tendon lengthening, tendon shortening, excision of muscles, resection of ankylosed joints, and tendon transplantation. The final results of this treatment have been good. Silk is to be used for suture material. A list of 27 cases including the one of Schramm follows.—*Walter G. Stern, Cleveland, Ohio.*

MISCELLANEOUS.

318. A Review of German Orthopedics of the Year 1903. By Oskar Vulpius. *Muench. Med. Wochenschr.*, Mar. 15, 1904, p. 491.

A mere notice of the contents of all articles on orthopedic subjects which appeared in German literature in 1903 is combined with a key which refers to the date and periodical. It includes inaugural dissertations, monographs, transactions of societies, and the papers appearing in the regularly published journals.—*Walter G. Stern, Cleveland, Ohio.*

319. **Hereditary Congenital Bilateral Supination Disturbance at the Elbow.** By Blumenthal. *Zeitschrift orth. Chir.*, XII Band, 1 und 2 Heft.

The head of the radius of both arms is not in its proper relation to the ulna. The right ulna and radius are shorter than the left. The two are partly fused together on both arms, in the pronated position. A review of the literature.—*Henry O. Feiss Cleveland, Ohio.*

VOLUME II. JANUARY, 1905. NUMBER 3.

The American Journal of Orthopedic Surgery

I.

SOME REMARKS ON THE TREATMENT AND AFTER-TREATMENT OF CONGENITAL DISLOCATIONS OF THE HIP.

PROF. DR. ADOLF LORENZ, VIENNA.

Ever since my first communication, concerning the treatment of congenital hip-dislocations by the bloodless method, I have followed with great interest the experiences and reports of other physicians with reference to the subject, having been always prepared, from whatever source it might have arisen, to adopt that which was better. In spite of this consummate purpose to better my method, by judging and trying various suggestions, this method has nevertheless remained completely unchanged in its entirety, during a trial of ten years, and I have nothing more of importance to add to what I have already described in my book.*

As to the technic of the reposition, I have nothing more to add; but I may say that it makes very little difference by what method the reposition is brought about, whether by the lever maneuvers of abduction, or whether by extension. Instrumental aids (machine contrivances—extension tables) are in neither case necessary. It is best to emancipate oneself from machine assistance. In the case of children under the age limit, the manual reduction is, as it were, playfully easy, and attained without exertion, so that the use of any such machine appliances ("Boston Machine") seems to me superfluous, to say the least. But when I add that by mechanical methods the intimate contact between operator and working object is lost completely; that he no longer can judge the resistance offered by the soft parts; that he no longer can palpate the fundus of the acetabulum and its borders, using the head of the femur as a probe; that he can no longer picture to himself the relations about the acetabulum—then I must designate the application of a reduction machine as a disadvantage.

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* Heilung der angeborenen Hüftverrenkung durch unblutige Einrenkung und functionelle Belastung.—Toepliz & Deutike, Wien, 1900.

Presented by title at the Eighteenth Annual Meeting of the Association, Atlantic City, N. J., June 8–10, 1904.

Moreover, the complicated extension appliances are superfluous, and are indeed under certain circumstances harmful in effect. Rhythmic manual traction overcomes every resistance, without carrying with it the danger of permanent traction. A method is not characterized by the art and manner of *reposition alone,* but it is characterized by the after-treatment, especially by the retention methods.

The most important rule in the retention is the temporary fixation of the thigh in *right-angled abduction.* It is important to note that this right-angled abduction does not follow indifferent or common extension (ordinary extension of the standing position) but from right-angled flexion. When a thigh flexed to a right angle is abducted to a right angle, it comes to lie from the sagittal, in the frontal plane. A child lying upon the back, whose thigh has been thus carried from right-angled flexion into right-angled abduction, shows therefore the following peculiarities in the way it manages its lower legs; the extended leg on the sound side lies with the posterior side and heel in contact with the underlying surface; the affected leg, on the other side, has its entire outer surface, as well as that of the foot, in contact with the table; the thigh forms a right angle with the side of the trunk; the knee-joint is bent to a right angle. If turning the thigh inward upon its longitudinal axis, is designated inward rotation, and turning it outward, outward rotation, then the position described entirely is distinct from such rotation, that is, the limb is turned neither inward nor outward. In this position, which we call the "primärstellung," or primary position, the reduced hip is fixed for from six to seven months on the average, by a plaster to the knee, leaving that free. If one observes the gait of such a child, one sees that the lower leg, on the operated side, owing to its dead (intrinsic) weight, is directed somewhat behind the frontal plane, so that the foot is stepped upon with its inner edge, wherefore it is indicated to raise the outer border of the shoe about 1 cm. This placing of the right-angled flexed lower leg behind the frontal plane results from the turning of the right-angled abducted thigh inward; while the leg is in function, the right-angled abduction of the thigh is associated with a slight inward rotation. This, however, is so slight, even in the functioning leg, that one may speak of the rotation in the primary position as an indifferent one. So long as this primärstellung is maintained, the femoral head remains in slight or extensive (surface) contact with the acetabulum, according to whether it is shallow or deep, assuming of course, that the reduction has been properly carried.

From this, the principle is deduced, that this primärstellung is to be preserved as long as possible. In the primärstellung, a "reluxation nach hinten" (posterior reluxation) (which would mean a complete failure) is as good as (completely) ruled out. And just as impossible is a reluxation upward (anterior upward reluxation, or subspinous position).

The only reluxation possibility exists in the inward direction, that is, medianward from the acetabulum. Should this condition occur remedy may be effected at a later period. Such a reluxation position, as well as a reluxation upon the edge of the horizontal ramus of the pubic bone, I have observed when, for purposes of security, retention of right-angled abduction had been combined with overstretching or hyperextension (the right-angled abducted thigh being pushed behind the frontal plane). I therefore no longer apply hyperextension, but content myself with right-angled abduction.

In cases of very bad stability of the primärstellung, the right-angled abduction may be exaggerated so that the angle, which the trunk and thigh make with each other, becomes acute (negative abduction). But, as a rule, this means is also superfluous.

For the primary position the simple right-angled abduction, as a rule, is sufficient. On account of the fixation in this position during a period of several (five or six) months, there results an artificial right-angled abduction contracture, because certain pelvitrochanteric muscles undergo shortening, due to the fact that their insertions are brought closer together continuously for a considerable space of time. This acquired shortening of pelvitrochanteric muscles is of the greatest importance in the after-treatment. With the gradual diminution of right-angled abduction, the shortened pelvitrochanteric muscles are rendered highly tense and this tension acts as a retention factor, because, by this means, the femoral head is pressed against the rudimentary acetabulum.

During late years I have carried out the after-treatment in the following manner: After the primary position of right-angled abduction has been maintained for five or six months (in cases of bad stability even longer), the plaster is removed and as a rule *no* subsequent one is applied.

In unilateral cases the right-angled abduction is corrected by gymnastic means *only so far* as to permit the child to walk easier. A high sole of 3 cm. or 4 cm., worn under the healthy foot, serves to maintain a considerable abduction angle. If the abduction contracture is very rigid, a simple bandage is applied, which draws the leg somewhat medianward. This bandage consists of a pelvic girdle, and a leather gaiter, about the breadth of a hand, which is applied to the knee of the crippled leg. This pelvic girdle and gaiter are bound together before and behind by a strap or straps, which may be shortened, in this manner bringing about adduction. Wearing this leather bandage, children are able to walk very well. *The correction into normal (indifferent) extension must take place very slowly,* occupying a period of many months or indeed a year. I hold firmly to the principle that, during the after-treatment, the facility, active and passive, of easily and unresistingly attaining the "primärstellung" (right-angled abduction) *is more important than the correction of the primärstellung into the normal extension.* Active and passive leg exercises, therefore, should have for their purpose, not merely to correct, but must also fulfil the important task of securing the facility of easily attaining the primärstellung.

To this end the child is laid in a plaster-bed at night. This is made by laying the child prone upon its front and modeling it with the reduced thigh placed in right-angled abduction. Such an abduction appliance, which is, so to speak, nothing more nor less than the posterior half of a fixation plaster, is accordingly well padded. In this manner we secure the exact maintenance of the primärstellung by night, whereas by day a gradually diminishing abduction is admissible. To attain right-angled abduction, the most important *active* exercise is that in which the child lies upon its well side and brings the crippled leg gradually to the perpendicular against light manual resistance. This sort of after-treatment is of especial importance in such cases in which the acquired abduction contracture is of lesser rigidity and the joint *more or less "wobbly."* In case of very rigid abduction contracture, it may at times be necessary to correct the same to an easier walking attitude, by bringing it forcibly down under light narcosis. In such cases, there is no danger of reluxation, and the facility of again obtaining the primärstellung is of no concern under these circumstances.

The further correction, from the primärstellung into ordinary extension advances the more noticeably as the limb assumes an attitude of outward rotation because the head of the femur does not plunge properly into a socket which is too flat. If this outward rotation disturbs one, it may be combated by methodic inward rotation. A certain degree of outward rotation remains persistingly, and I can see absolutely no disadvantage therein. Forcibly rotating the thigh inward may lead to posterior reluxation of the head, and so to complete loss of the result sought for.

Moreover, after attaining the normal extension attitude of the leg, a high sole of about 1 cm. to 2 cm. retained under the foot of the well side is advisable in order to secure a *habitual abduction* in the reduced joint. Soles of equal height, in which any residual shortening is eventually compensated, are only admissible after the stability of the position permits it.

Mutatis mutandis, the same laws hold in the after-treatment of double luxations. Here, too, I have departed from overstretching (hyperextension), as this tends in the same way to bring about reluxation upon the horizontal ramus of the pubic bone, and I content myself with right-angled abduction, which, only in very unfavorable cases is increased to negative abduction. The primärstellung is held fixed for five or six months by means of plaster. If at the end of that time the joint is still wobbling, then the primärstellung is held fixed anew for another two or three months. As a rule, however, a second plaster is not applied.

If the primärstellung is found strongly contracted, a correction of the same into the walking position (*i. e.,* in abduction lessened only so far that it is possible to walk) is undertaken, under light narcosis. This correcting plaster remains only a very short time—perhaps eight days—after which gymnastic treatment begins. In cases of lesser rigidity of the primärstellung, no second plaster is applied, and gymnastic after-treatment begins immediately after the removal of the fixation plaster.

The lessening of right-angled abduction is brought about in a gymnastic way by active and passive exercises promoting abduction, and at first only carried so far as to acquire a pretty fair degree of abduction, by which walking may be possible. In order to secure this position and to prevent the undue abduction of the legs, a small leather bandage is applied. This consists of a stocking fastened about the knee-joint on each leg, and the two connected before and behind by a narrow strap. Correction to the normal standing position of extension of both legs must be allowed to take place very slowly and carefully during a period of many months.

Here again I hold to the principle that *the facility of easily gaining the primärstellung is more important than the correction.* So long as it is possible to attain the primärstellung actively and passively, easily and without pain, so long may we be sure of retaining the femoral head, at least, in that best possible position, which we were able to gain at the time of the reposition. Action of the adductor muscles is lastingly eliminated.

Children who have been treated in this fashion, are able, without any trouble, to assume the socalled "trick position" or "split attitude," which is the ability to sit upon the perineum with the legs thrust apart at right angles. After gymnastic treatment has fulfilled its purpose of correcting the primärstellung into the normal extension attitude, then the only remaining problem consists in retaining the easily attainable primärstellung. This is done by using a plaster-bed at night. This is modelled over the pelvis and thighs of the pronated child, the hips being in the primärstellung, and thus, after it is padded, represents a mould, which corresponds in a manner to the posterior half of the original fixation plaster. The outward rotation which accompanies diminution of the primärstellung, and which is somewhat more frequent in double cases, is treated gymnastically, yet nevertheless corrects itself spontaneously to a certain degree, after a long time, so that, indeed, it becomes of no concern whatever. The foregoing method of treatment is so simple that it may be carried out at home by the mother without the least trouble.

As to the results, they are entirely satisfactory, at least as regards function.

If head and socket are fairly well developed, then we may succeed in fixing the femoral head in the acetabulum and in arriving at a faultless result, at least as regards function. Absolutely normal anatomic relations can naturally seldom be attained, and the expert will recognize a reduced joint as such, as well in the Röntgen picture as by clinical examination; in many cases, however, such a complete restitution *ad integrum* is reached that one may speak of a cure in its strictest sense. But even an imperfect anatomic result is compatible with a satisfying and even good functional result, providing that the head has found a bony support upon the os ileum.

Very often, in bringing down the leg, the femoral head shifts its position upward and fastens itself in the region of the anterior inferior spine. In such a case one refers to it as *forward transposition.* I believe this expression is poorly chosen, because a faultless retention of the head in the acetabulum is brought about also by a *transposition* of the luxated head *forward.* I refer to such a case as a *reluxation forward and upward,* or an *anterior superior reluxation,* or as a *subspinous position.* Such a position is very easy to recognize clinically, because the pulse of the femoral artery beats no longer upon the rotating head, but interior to it. The head of the bone is therefore located somewhat too far external and somewhat too high, but still always below and inside of the anterior superior spine. The slight residual shortening that remains does not interfere essentially with the functional result, but in these frequent cases, the pelvitrochanteric muscles must be nursed and maintained with especial care. Posterior reluxations (which represent complete failure) fortunately occur very seldom. Only in three cases (so far) have I had to repeat the reduction on account of posterior reluxation, and in this second reduction, which was made about two years after the first operation, I have every time been surprised to find a better primary position than at the time of the initial reposition.

In several cases I have met a position of the head which represents, so to speak, an intermediate position between anterior superior reluxation and posterior reluxation. I have called this position "lateral apposition." Such cases represent anatomic results to the slightest degree, or are perhaps complete anatomic failures; the head hardly touches the acetabular surface at all. The upper end of the femur is closely applied to the side of the ileum in a practically sagittal direction (lateral apposition), the trochanter being behind; the head is found at the outer end of the inguinal sulcus and located somewhat below and *outside* of the anterior superior spine. It would be an error to refer to this position of the head as posterior luxation, as the anterior pole of the head still extends to the inguinal sulcus and may indeed perhaps cause a perceptible prominence there. Motion at the joint is essentially limited, especially the inward rotation, which is almost impossible, and every attempt in that direction calls forth energetic muscular resistance, manifested in the patient by a decided movement of defense. But even this evident anatomically bad result is in reality not synonymous with a functionally bad result. Indeed such children walk surprisingly well after compensation of the residual shortening, although, of course, the limp remains noticeable. But other complaints disappear and as regards the endurance of such children, it satisfies all reasonable demands. One need feel no fear whatever that lateral apposition represents a step to posterior reluxation and thus to a complete loss in the result. I have seen on the contrary that this lateral apposition has remained unchanged for many years. It is very probable, that the striking frequency with which reluxation occurs forward or superiorly forward, is caused by the pathologic anteversion of the femoral neck.

In order to remedy this difficulty it was proposed by Schede, as is well known, to select abduction and inward rotation as the primärstellung, to fix in this position for several months, and finally to correct the excessive inward rotation by osteotomy in the lower third of the femur, while at the same time the upper part of the bone is held in its position of inward rotation by means of a golden nail driven through trochanter head and neck. From a theoretic standpoint, there is nothing to bring forward against this proposal. Indeed, I had myself pointed to the possibility of doing away with artificially gained rotation positions by means of osteotomy (with subsequent *dislocatio ad periferum*), before the osteotomy was proposed by Schede for this purpose. With marked anteversion of the neck, we must as a matter of fact, point to the primary position of inward rotation, followed by osteotomy of the femur, as the only means of preventing anterior superior reluxation or lateral apposition. In spite of which, I have never as yet carried out osteotomy, but have contented myself with those functional results which, in cases of strong anteversion, are attainable by a bloodless way. In several cases, which had been treated by primary inward rotation and subsequent osteotomy I have seen very bad results from the treatment owing to posterior reluxation.

This danger of posterior reluxation is occasioned by the excessive rotation inward; it requires strong hyperextension of the joint to lessen this danger. Added to this it is to be noted that in cases in which the neck of the femur is anteverted to a marked degree, the acetabulum is also usually underdeveloped, and is therefore able to offer little support to a femoral head, even if it is normally directed. In such reluxations, I have arrived at quite satisfactory functional results by the bloodless treatment carried out subsequently.

If on the one hand, I concede that one is fully authorized in using a primary position of inward rotation followed by osteotomy, in cases of marked anteversion, I must state on the other hand, that all my patients have been so satisfied with the bloodless treatment, that I have as yet not found occasion to complicate my method, which was conceived as a bloodless one, with any supplementary bloody operation.

It is by no means seldom that patients will not agree to a transition from a bloodless to a bloody treatment, and therefore interrupt the treatment to their own detriment. In one very interesting case of this kind—it was a case of double dislocation—the hips were fixed in the primary inward rotation position on account of unfavorable anatomic relations, for a very long time (over a year) and were next to be corrected by bilateral osteotomy. The parents refused consent and stopped treatment, which was therefore continued further by the bloodless method. It was found possible to diminish the inward rotation by methodic gymnastics without the feared luxation taking place. Proof therefore was offered, that the proposed osteotomies were unnecessary.

If one concedes that the procedure of Schede may be of use in some cases of marked anteversion of the neck, on the other hand it is firmly established that it is unnecessary to do osteotomies in more than half the cases, as was practised by Schede. Till now I have not in a single case had recourse to such a means, and, although I have not always satisfied myself, I have nevertheless been rewarded with the satisfaction of my patients by using a bloodless method.

According to approximate statistics of end-results of such cases, in which a period of at least two to three years has elapsed since the reduction, the relation between anatomically good and anatomically imperfect results is brought out by the following:

Out of 364 cases of unilateral dislocation 218 gave anatomically good results while 127 showed subspinal positions (anterior reluxation, upward and outward) and 19 showed lateral appositions.

Out of 158 cases of bilateral dislocations, 70 showed good anatomic results on both sides, 19 resulted in subspinous positions on both sides, 7 showed lateral apposition on both sides, 49 resulted in anatomically good results on one side, while the other side became subspinous; in 4 cases one side became anatomically replaced, while the other side showed lateral apposition; in 9 cases one side was subspinous, the other lateral apposition. Taking all the hips together (364 + twice 158 = 680), 358 of these show good anatomic results, *i. e.*, 52.6 per cent.—a good half of the cases.

Further, I wish to be permitted a word upon the age limits for bloodless reduction. I believe that the endeavors to increase the upper age limit are not justified by the results obtained by forcible reduction of old luxations, and that these results do not make up for the great danger which goes hand in hand with forcible redressment. Putting aside exceptional cases, I still believe that the age of nine years to ten years should be the limit for reducible unilateral cases, and seven years to eight years for the bilateral. In individual cases beyond the age limit, reduction has been effected after repeated sittings. I do not favor reducing by degrees in this manner. As we approach the upper age limit, the reduced joints tend to a stiffening which often simulates a functional ankylosis.

If reduction is impossible in cases beyond the age limit, using a reasonable amount of force, there is still a thankful object to be gained by bloodless therapy. In such cases, in both unilateral and bilateral luxations, I employ the socalled "inversion" of the joint, that is, reversing the existing position of the joint into an opposite "habitual" position. Under all conditions, such old dislocations manifest adduction contractures, combined with more or less flexion. We have, therefore, to deal with the task of changing an existing flexion adduction position into one of habitual abduction hyperextension. This "inversion" is executed in exactly the same way as an intended reposition.

First, one does away with the resistance of the adductors by subcutaneous, bloodless myorrhexis, and obtains a considerable abduction. Then the subspinal soft parts are severed by subcutaneous myotomy, and hyperextension of the joint is attempted. The procedure, according to the principle of modeling "redressment," is continued till a considerable abduction hyperextension attitude is possible without undue tension of soft parts. This attitude, which is quite compatible with the walking posture, is sustained for two months or three months by means of a plaster, allowing the knee-joint to be free. We concern ourselves here not with a reduction, but with forcing the head against the upper outer end of the fossa inguinalis. This, driving the head forward, takes place owing to the ever-stretching hyperextension. By stretching the adductors, we try to gain a sinking of the corresponding half of the pelvis, and therewith an apparent compensation for the shortening.

The acquired habitual inversion of the pelvis on the corresponding side (by the habitual abduction position of the joint) also creates, on account of the accompanying apparent lengthening of the leg, *much better mechanical conditions for the weight-bearing function* of the head of the bone. Under the previously existing adduction, the head finds no support on the steep external surface of the ileum; the entire weight of the upper half of the body is borne by the stretching of the pelvitrochanteric soft parts, from which arises the painful exhaustion, after the use of the leg for a short time. After establishing the habitual abduction attitude, the relations become far more favorable, because the more horizontally placed center of the ileum offers a better bony support, and acts in a manner as an improvised acetabular roof. After-treatment consists in active and passive abduction and hyperextension gymnastics, with attention to the pelvitrochanteric muscles.

The result of such palliative treatment by the "inversion" of the luxated joint, lies, in the case of unilateral luxation, in the noticeable apparent lengthening, in the disappearance of the pain, in the marked improvement in the limp, and above all, in the acquirement of a very satisfactory power of endurance in walking.

In bilateral dislocations the thing to be aimed at, above all, is the improvement of the attitude of the trunk by lessening the significant lordosis; the necessary hyperextensibility of the joints must be maintained, by daily applications of heavy weights upon the buttocks, with the knees firmly supported. Long-continued attention to the pelvitrochanteric muscles (in which the exercise of alternately standing on one leg, at the same time holding the pelvis as horizontal as possible, plays an important rôle) becomes an essential step in the after-treatment. Such patients, when provided with good supporting corsets, display at times quite unexpected good functional results, as apparent in the appearance and power of endurance in walking, as in the shape of the trunk. In any case, it is firmly established that such results are attainable in a simpler and easier way than by subtrochanteric osteotomies, without at the same time sharing the disadvantage of the shortening which is a necessary accompaniment of the operation.

With reference to the lower age limit of bloodless redressment, I take the stand that it should not be lowered too much, for practical reasons. As a rule, the dislocation is not discovered till the child begins to walk. This holds especially in the double cases, in which there is no inequality in the lengths of the legs and therefore no indication for an examination. But even in unilateral cases, if the existence of a subluxation or even a complete dislocation is discovered, the child being as yet still unable to walk, and the evident disturbance in function has occasioned an examination, I hold that it is not opportune to begin treatment at once, because it means a never-ending torture to the delicate child as well as to the parents. Before beginning treatment, I wait not merely till the discrepancy in the gait declares itself beyond any question, but till the child is able to keep itself clean. Then, for reasons which are easily deduced, the treatment is so much simplified that I am accustomed to wait till the expiration of the second year before attempting reduction. It pleases me most, if the children come to me for treatment after the expiration of the third year. By this time the unclean accompaniments following reduction are done away with; and on the other hand there is the important advantage that the greater tone of the soft parts materially enhances the stability of the primary position after the reposition is brought about, and so increases the chances for permanent retention.

In conclusion, as to the practical value of the Röntgen images in judging prognosis and the results arrived at, I must say, first of all, that to question the scientific value of the investigation of cases by such means (radioscopy) is farthest from my intention, as goes without saying, but I must warn against basing judgment as to prognosis, upon the Röntgen picture *alone*, and underrating or perhaps overlooking entirely the clinical aspect. On the contrary, the clinical examination as regards prognosis seems to me far more valuable than the Röntgen picture. Interpretation of such an image with reference to the direction of the neck of the femur is unreliable, if the rotation position of the leg during the exposure is not well understood or not carefully taken into calculation. On the other hand, a single grasp of the trained hand (with the transverse knee axis placed in the frontal plane) is sufficient to convince one, not only as to the anteversion (if more than slight), the size and the development of the head, but also as regards the length of the neck.

Again, in forming judgment as to the condition of the rudimentary acetabulum, the Röntgen picture is liable to mislead, for it may induce one to believe an acetabulum to be well preserved and of sufficient depth, whereas its dimensions may be altogether imperfect on account of the thickening of the cartilaginous cover. Of course, even the clinical examination with reference to acetabular relations may be unable to lead to correct conclusions. But with regard to this point, I should like to communicate my experience, that in cases in which the head and neck have been well developed and well directed, I have found, with extraordinary frequency when it came to reduction, that I was dealing with a proportionately well-preserved acetabulum, so that, if I have a good femoral neck, I conclude that I have a good acetabulum, and herein I have seldom been wrong. The most unmistakable conclusions as to the acetabulum are to be drawn from the clinical aspect after the reduction is completed, the great test being the primary stability of reposition. In the act one may use the head as a probe, and picture to oneself with great exactness the edges and the depth of the socket.

A further advantage of the clinical examination in establishing the prognosis is still to be mentioned, namely, that by this means one can form a good judgment with regards to the elasticity of the soft parts. I regard a Röntgen picture merely as supplementary evidence in the investigation, with reference to prognosis, and lay greatest stress upon the aspect brought about by clinical examination. He who reasons in the opposite way will err much oftener.

Also in judging the anatomic results secured, does the clinical examination give sufficient evidence; from the points of evidence shown above, it is certainly not difficult to distinguish a normal position of the head, from a reluxation upward and forward, or even from a lateral apposition. The Röntgen picture gives absolutely reliable information in judging correctly the position of the head as regards its height in the vertical sense, but it throws no light upon the question as to whether the head is further forward or behind in the sagittal direction. The stereoscopic Röntgen image alone displays complete clearness of the relations, and is of the greatest value.

However, it would be an error, and would lead to an absolute undervaluation of the practical worth of the method, if we formed our judgment of the functional results of the bloodless reposition from evidence drawn from radioscopy alone. We should come to the unjustified as well as false conclusion, that the method is valueless in nearly half of the cases, which conclusion is entirely inconsistent with everyday experience. If the functional —that is to say, the practical result is satisfactory, I do not lay too much stress upon the Röntgen picture. *Nil perfectum sub sole!*

II.

THE ULTIMATE RESULTS OF MY BLOODLESS REPOSITION OF CONGENITAL DISLOCATION OF THE HIP.

PROF. DR. A. HOFFA, BERLIN.

Since the visit of Professor Lorenz to your country in 1902 the question of final results of the bloodless treatment of congenital dislocation of the hip has been extensively discussed, and I therefore feel that you will be interested in knowing the results that have been obtained in Germany with this method.

I have studied very carefully without prejudice the various bloodless methods and only with a desire to obtain the best possible results. In communicating to you the results of an experience derived from a field rich in this sort of material, I hope to be able to give you approximately an idea of the results that are to be expected from this method of treatment.

When the bloodless treatment was originated it was used in the treatment of older patients especially. Great force was used in attempting to bring the dislocated head of the femur downward into the old acetabulum. You are all familiar with the very extensive injuries that were thereby often inflicted. Rupture of the vulva, tearing of the perineum, fracture of the neck of the femur and even of the shaft, paralysis of the quadriceps and sometimes of the whole leg, even rupture of the vessels followed by gangrene of the leg, were some of the untoward results following these procedures.

My own experience very early caused me to abandon such injurious methods and to no longer use the bloodless method in older patients. In examining older patients I have commonly found that the head of the femur was dislocated very much upward, and that the greater the age of the patient, the greater the displacement. However, this is not always the case. You all know that age is not necessary to great displace-

Presented at the Eighteenth Annual Meeting of the Association, Atlantic City, N. J., June 8–10, 1904.

ment since even in very young children we sometimes find the head very considerably displaced upward, while in older patients in some cases the head is relatively near the old acetabulum and can be brought down very easily. Therefore we will do better, in determining the limitations of the bloodless operation, not to depend entirely on the age of the patient, but to determine the degree of upward dislocation of the head and the shortening of the tissues connected with it, especially the shortening of the muscles and the rigidity of the joint. By observing these things the extreme limit of the bloodless method will be found to be, I believe, from eight to ten years in unilateral dislocations, and from six to eight years in the bilateral cases. In patients who have passed these limits of age real reposition is impossible because of anatomic and pathologic causes. The head and acetabulum are so altered and deformed that the grasping of the head by the acetabulum from all sides cannot be obtained. Below the above-given age limits, I have mostly succeeded in replacing the head in the area of the acetabulum by using the bloodless method of Lorenz, that of Schede, or the one which I myself have devised. The reposition can be readily accomplished without difficulty and regularly performed in young children with loose joints. If there is a high degree of shortening and great rigidity of the part, I never force the reposition, but bring the result about gradually. Sometimes at the first sitting the head can be brought down only to the brim of the acetabulum and fixed in this position by a plaster-of-Paris bandage, the leg being abducted and rolled outward as much as possible. After a week, reposition is again tried and it is often surprising how easily this may then be accomplished. If the dislocation cannot be reduced at the second trial, the limb is again fixed in the obtained position and after some time another trial is made. All forcible manipulations are to be avoided because no benefit is to be derived from such treatment and often very great damage is done even if the dislocation be successfully reduced. Before the age limits given the reduction can usually be accomplished without difficulty. The head should be placed as nearly as possible in the acetabulum. When reduction is successful the result will be known by the peculiar snap imparted to the operator when the head slips into place. Palpation will give us the same information and the X-ray may be of service. The limb is secured in position by plaster-of-Paris, the position varying with the degree and kind of deformity of the head and neck of the femur. The method of Lorenz in which the limb is placed in a position of flexion, abduction and outward rotation may be used, or abduction and inward rotation. Commonly the cast is to be removed at the end of four weeks, when an X-ray picture will show the position of the head of the femur. If the condition be found satisfactory, the limb is again to be placed in plaster-of-Paris for a period of at least three months. When the cast is removed, the condition of the joint is always to be determined by means of palpation and an X-ray picture. If reposition has not been successfully accomplished, another effort should be made to bring about this result, and the cast again applied for a period of three months. If, after three trials, the bloodless method fails I abandon this form of treatment.

Next after the casts, I attach great importance to the after-treatment which consists essentially in active gymnastic exercises, massage of the muscles, and the avoidance of forcible adduction. Often we find, especially in the older patients, a rigid fixation of the really replaced head, the position being one of abduction and outward rotation. This condition may resist all treatment. It is my opinion that this fixation of the head in the acetabulum is not due to muscular action, but that it is of mechanical origin, the head being retained tightly in place by the triangular acetabulum, and motion being impossible. In these cases I propose the correction of the faulty position by a subcutaneous osteotomy.

Following the principles which I have just given you, I have treated more than 400 cases of congenital dislocation of the hip; 315 of these cases have been discharged from treatment for a period of at least one year. All of these 315 cases have been again examined within the last month. X-ray pictures have been taken, careful examinations made and exact notes taken on these cases. I shall give you the results which have been obtained in these cases.

Of the 315 cases, 250 were unilateral and 65 bilateral dislocations. Of the 250 cases of unilateral dislocation, real anatomic restoration was obtained with perfect function in 75 cases so that the children walked like normal children. This amounts to a real cure in 30 per cent. of the cases. In 160 cases or 64 per cent. we obtained only an anterior transposition of the head by the use of the bloodless method. In these cases the head has found some support below and external to the anterior inferior iliac spine. The head may be felt beneath the anterior superior spine of the ilium, the neck of the femur standing more or less sagittally, while the great vessels lie to the inner side of the head. One hundred and ten of these cases, that is, two-thirds of the 160 cases, show an essential improvement over their former condition. The shortening of the leg is less, the lordosis of the lumbar region is removed and the gait is a good one, so that in some cases only an exact objective examination shows the still abnormal position of the head of the femur. In 40 of the 160 cases the function of the leg is not satisfactory. The great trochanter is usually very prominent and there is considerable limp when walking, which in some cases is greater than before the attempted reposition. In these cases the head of the femur may be dislocated backward on the ilium without difficulty by flexion and adduction. In 15 cases amounting to 6 per cent. of the unilateral cases we found a complete reluxation of the head in its old position. The cases of anterior transposition of the head with good function can surely be called good results by the bloodless method, since the only important thing to the patient is the ability to use the leg without regard to the point where the head has found its support. If we place these cases with those actually replaced, all cases with absolutely good function, we have a total of 185 cases or 75 per cent. of satisfactory results in 250 cases of unilateral cases, and in 65 cases or 25 per cent. were failures.

The results have not been so satisfactory in the bilateral cases. Altogether 65 cases were operated upon by the bloodless method, both sides being reduced at the same time. Of these 65 cases only 5 or 7.7 per cent. showed at the after examination a perfect anatomic result and faultless function of the legs. Only these few cases can be cited as perfectly cured cases. We obtained anterior transposition of the heads in 32 cases equaling 50 per cent. of the bilateral cases. While these cases are not perfect cures they are much improved. The lordosis and the lame gait have almost disappeared, the legs are parallel and can be abducted normally, so that there can be no doubt as to the benefit of the operation. In 10 cases or 15.3 per cent. the head is apparently replaced on one side while on the other it is either an anterior transposition or a complete reluxation. These patients have received no benefit from the operation showing in all cases a noticeable limp on the side or reluxation. Finally, in 18 cases or 27 per cent. a reluxation has occurred on both sides. Of these cases a great number are older patients in whom the prognosis, as stated already, was unfavorable.

Gentlemen, these are my results with the bloodless method. On the whole I feel that the treatment has been very satisfactory, and that we should be grateful to the originators of this method, Paci and Lorenz, for their contribution to useful knowledge. If we succeed in curing only a portion of these unhappy patients without the use of severer measures, we must admit that great progress has been made. The impossibility of curing all these patients depends upon the pathologic anatomy of congenital luxation of the hip, the rudimentary development of the acetabulum, the deformity of the head and neck, and the conformation of the ligamentum teres and the capsule. If we cannot succeed in overcoming these obstacles by the use of the bloodless method, there yet remains the open operation by which success may be attained in cases where the bloodless method has failed. I have operated upon a great many such cases after such a failure, and by the use of the open operation I have succeeded in curing about 80 per cent. of all my cases of congenital dislocation by the use of the combined methods, so that the results have been quite satisfactory both to the patients and to myself. My experience in this field extends now over a number of years. You may ask me what conclusions I have reached as a result of this experience: I will answer by saying that in my opinion the earlier children with congenital dislocation of the hip are subjected to treatment, the better will be the results. Our chief work must be, therefore, to teach our students to make an early diagnosis of the condition. Physicians must learn to make careful and accurate examinations of children when they are brought to them by parents. Perhaps it would be well to have an X-ray taken in all doubtful cases as early as possible. If diagnoses are made early, future generations will find the treatment as easy and as successful as we now find the treatment of club-foot, which is now subjected to treatment very early. If bloodless reposition does not yield satisfactory results, the open operation is to be performed immediately because even in the open operation the results are very much better when early treatment is instituted.

For the present I would advise that neither the bloodless nor the open operation be forced upon all patients, and that in unsuitable cases we be content with some one of the palliative operations as the pseudarthrosis operation, or subtrochanteric osteotomy. By adopting these measures you will thereby save both the patient and yourself much disappointment and grief.

III.

AN ARGUMENT CONCERNING THE METHOD OF TREATMENT OF CONGENITAL DISLOCATION OF THE HIP.

HARRY M. SHERMAN A.M., M.D., SAN FRANCISCO.

There is a line of argument concerning the method of treatment of congenital dislocation of the hip, which is to-day being forgotten. I desire to review it because it opposes the reduction of the dislocation by any kind of forcible manipulation, and perhaps will tell against manipulation where but moderate force is used.

In 1899 I reported, at the New York meeting of the American Orthopedic Association, thirteen manipulative reductions; of these one is an anatomic and functional success, one is probably an anterior subluxation because of interposed capsule between the head and acetabulum, one was an anatomic success but became ankylosed after an exploratory incision and consequent infection. Two of these cases are verified by very recent, or comparatively recent examination. The ankylosed one has passed from observation. There is nothing to add to the statement then made of the failures to maintain reduction in the other cases.

The previous year, 1898, at the Denver meeting of the American Medical Association, I reported, as part of a general report on the work I had been able to do, the case of a girl, six years old, with both hips out, on whom the manipulation plan apparently succeeded, but really failed. A second attempt again apparently succeeded on one hip and again really failed, and on the other hip the failure was a frank one. In this case I finally did arthrotomy and found that, in the joint in which the second attempt had apparently succeeded but had really failed, the interposed capsule, and the impossibility of putting the head through the narrow part in the capsule was the cause of the

Presented at the Eighteenth Annual Meeting of the Association, Atlantic City, N. J., June 8–10, 1904.

failure; in the joint in which the failure was a frank one the same obstacle existed and the capsule was full of bloody synovia, showing that the manipulations had been decently forcible and fairly well directed. Both hips were reduced by arthrotomy and the child left the hospital with each *in situ*, but her condition and whereabouts are not now known.

However, since this operation which was done in 1898, I have made no attempts, save one, at manipulative reduction, but have, instead, done the operation by arthrotomy in all instances.

As regards the manipulative method, I am sure that Lorenz told the whole truth when he stated that the obstacle to reduction was the narrowed part of the capsule just at the posterior and superior, or superior part of the acetabular rim. If the opening, at this narrowed part, is big enough to permit the head to pass, reduction can be accomplished by manipulation, and may be maintained if the acetabulum is deep enough. I have in two instances done this, I know. But in the twenty-eight hips in which I have done arthrotomy, and in which I have explored the narrow part of the capsule by my finger, and so know its size and the strength of its walls, there has been but one case in which the passage of the head would have been possible. I am not too dogmatic when I say that no possible force could have put the femoral heads through the narrow part of the capsule in any of the other cases. One possibility, and twenty-seven impossibilities!

Now what happens when attempts are made to accomplish this impossibility? Lorenz has reported plenty of fractures of the femur and one each of the pubis and of the ilium, and other operators have done the same. (Davis: AM. JOUR. ORTHO. SURG., Feb., 1904.) Lorenz reports 7 cases of paralysis out of 400 odd operations, but Taylor (AM. JOUR. ORTHO. SURG., Feb., 1904), *looking carefully for* the condition, finds 11 cases in less than 50 operations, by various operators including, I believe, Lorenz himself. While Taylor states that most of these cases recover, the uncertainty of the result is patent to all who have had the misfortune to injure a few major peripheral nerves. It surely is an accident that cannot be disregarded. My own contribution to the casualty list is the report of a case of Lorenz's own, of rupture of the capsule of the hip joint, distal to the constriction, and the thrusting of the femoral head out among the muscles of the thigh. While only one case was *shown* to have had this accident, still, from the similarity of the clinical conditions, I believe another had it, and it is not in the least impossible or improbable that it occurs in very many cases, especially in the class called "anterior transposition." Finally, on all sides one finds the absurdity of the term "bloodless" pointed out and the reference to the lacerations of muscles, the extravasations of blood and hematomas. And last of all Lorenz has reported one case of gangrene of the whole lower extremity.

These accidents *must* make anyone who is not an enthusiast, or a special pleader, stop and think. One must say that to justify the exposure to such risks the percentage of successes, anatomic and functional, must be high, so that the benefit may, in the opinion of all, outrank the possible harm.

What is the percentage of successes?

From what we have seen of the Lorenz results, scattered between Boston and San Francisco, we cannot believe that he ever really got good anatomic results in about half of all his cases. I am told that Wolff's claim was for only 25 per cent. of anatomic repositions, and Ridlon, in the most recent pronunciamiento, claims only 10 per cent., though he hints at 20 per cent. Is this enough?

One hundred children out of one hundred are exposed to fractured bones, injured nerves, lacerated muscles, torn capsules and ruptured blood-vessels.

Ten out of the one hundred may expect to get the prize sought.

Sixty out of the one hundred may get the doubtfully "good result" of an anterior transposition.

Thirty children out of the hundred are perhaps to be considered fortunate if they get nothing.

In all seriousness I declare that the percentage of successes is not enough to warrant the risk; and personally I claim that the percentage of successes is not enough to justify the method apart from the risk. I am perfectly ready to subscribe to the satisfaction, for all parties, parents, patient, and surgeon, which comes from a perfect anatomic and functional result, for I have experienced that satisfaction. But I deny that there can be any special satisfaction in the "anterior transposition," the result that has to be dubbed "good" in quotation marks, the result that still leaves a short limb and a limp, the result that in its failure may only suggest the quotation from Bret Harte, "He done his level best," as an excuse for the surgeon.

Ridlon quotes the earlier statistics of the operation for carcinoma of the breast, an ultimate mortality of 90 per cent., to excuse the 90 per cent. of failures to get anatomic results in congenital dislocations. But the 90 per cent. ultimate mortality in carcinoma of the breast was not satisfactory to surgeons and methods *had* to be devised to lessen it. That they have been devised is shown by Kocher, who now quotes 42 per cent. of the cases sound three years after operation. The same dissatisfaction belongs to the results in congenital dislocation of the hip. We are bound to improve the methods by eliminating the risks which are too many and too great and too awful. *We have got to* increase the number of cases in which the head is really and honestly put *into* the acetabulum, the cartilage of the head in actual contact with the cartilage of the socket. We are under the obligation of improving the methods for making this *actual* reposition permanent. In brief, we must improve in every particular, the quality of the results we offer the people in these cases.

If we, as orthopedists, read what general surgeons teach and practice concerning the treatment of traumatic dislocations we shall see that they all deprecate the use of undue violence. Manipulation must be based on the most accurate knowledge of the mechanism of dislocation, and must be restricted to reduction without adding to the trauma. To accomplish this the dislocated bone must traverse, in its return, the path it made when it was displaced. Never must it be ground through a new path. If reduction is not possible by moderate force and in a reasonable time, an incision is imperative to permit the path to be cleared, the reduction to be done and the parts to be restored to the approximate anatomic relations.

No general surgeon to-day would countenance the use of extreme force in the treatment of an old unreduced traumatic dislocation. Moderate force, if it promises success or attains it, is advised, but extreme violence or prolonged efforts are wrong. In the light which an incision lets in otherwise insuperable obstacles are cleared away. In no instance of a recent or an old dislocation would a general surgeon attempt to jam a too large bone through a too small hole, and the passage of the femoral head through the constriction of the capsule in the case of the congenital hip dislocation, he would recognize as, in the great majority of cases, an impossibility.

If we turn to fractures the advice and practice is the same. When the inside conditions of a fracture are such that satisfactory replacement of the fragments is impossible from the outside, the general surgeon makes an incision and deals with the fragments immediately.

I do not forget that, as orthopedists, we are teaching much to the general surgeon, and that we shall probably teach more; but we must be careful that we do not in this instance abuse his confidence and so invite him to criticize; for the general surgeon *knows* that the trauma of an aseptic incision is practically nothing in contrast to the injuries recited as incidental to the forcible manipulative method. An incision less than that required for an appendicectomy, less than that required for a nephorrhaphy, less than that required for an intraabdominal shortening of uterine ligaments, less than that required for a herniorrhaphy, less than required for a lithotomy, less than the admittedly often necessary exploratory celiotomy. If the general surgeon, the world over, would not balk at this little incision, why should we? Or, if those of us who do some general as well as some orthopedic surgery would not shy at incisions for some objects, why should we do so for other objects?

If I am not afraid to open the knee joint to take out a floating cartilage, and I am *not* afraid to do this, *why* should I be afraid to open the hip joint to clear away the obstacle between the acetabulum and the femoral head?

I really do not believe that the definiteness of that obstacle is appreciated or else this question would not be necessary. In the case of a child who had a congenitally dislocated hip, who had never walked and who died of a pneumonia sequent to measles, I secured the os innominatum and the whole of the limb. Before the child's death I had tried a manipulative reposition, using carefully regulated force, and apparently had succeeded; that is, the head went with a hop and a click to some place near the acetabulum. A week after this, however, reluxation had occurred. I then definitely reduced through an incision and while in the splint the fatal illness supervened. The necropsy of the hip joint showed that my incisional reposition had not been permanent, the femoral head was posterior and superior to the acetabulum and the incision in the capsule had healed so perfectly that it could not be found, so that the original local conditions were restored. Now with all of the tissues removed from the bones except the capsule, and able to get a thoroughly good hold of the parts and to guide my efforts by sight, I was still unable to put the femoral head *into* the acetabulum. At the present time I am fairly familiar with the feeling gained by thrusting the forefinger down into the constricted part of the capsule after the joint has been opened, and in the operation which was done upon this child in life the constricted part was not different from what it has been in other children, nor was it different after death, when I examined the joint. I am stating a fact when I say that no one in this world could by manipulation alone, put that femoral head into that acetabulum before death or after death, yet the child was but ten months old and had never walked. In the 28 cases in which I have opened the joint and put in my finger I have found *one* case that could surely have been reduced by manipulation, but only one. In all the others the femoral head was too big and the constricted part too small for the one to go through the other. It is literally the case of the camel and the needle's eye.

If this disproportion is such as I have described it, and I know that it is so; or if it is half as great as I have made it out, and it surely is that; if it is only so bad as to make anatomic reduction impossible in 75 per cent. to 90 per cent. of the hips, why submit that number of hips to the forcible manipulation now in vogue? Why follow an inexact and vulnerating method which gives a small percentage of anatomic reductions, when we have at hand, a simple and exact surgical method which will permit the reduction to be definitely accomplished in practically *all* the cases that are of suitable age?

Of course if we are to save these cases, irreducible by manipulation, from the risks of forcible manipulation we must save all, for no one can tell, *a priori*, which case is to prove reducible and which is not; and that will mean that all congenitally dislocated hips shall be reduced by arthrotomy, so that the operator knows just what he is doing, does what he wishes and does not do what he does not wish. Moreover, it means that all hips, in the suitable ages, shall be definitely reduced; the surgeon will actually put the two parts together, and, so far as the conformation of the parts permits, they will stay in that relation. If, however, the parts are so malformed that a reposition which shall be stable is not possible, there will be a reluxation or a subluxation, possibly an anterior one. This is just as likely to occur in the arthrotomy reductions as in the manipulative reductions, and no more likely. It will be a late result, and the mechanically inevitable result of preëxistent anatomic conditions; it will not be the result of an inexact and incompetent method. Personally I much prefer to be able to say to parents that I have put their child's bones together properly, but that the bones are too mishappen to remain together, than to have to say that I could not put them into any anatomic relation whatever.

Finally, by the arthrotomy method the patient will have been saved the exposure to paralysis, which comes at the rate of from 2 per cent. to 20 per cent. of the cases; will have been spared the risk of a broken leg or pelvis; will not have had the contusion and lacerations of the muscles about the hip which result in ecchymoses and hematomas and possible gangrene; and will have been exposed only to the one danger of sepsis, the possibility of which should not be greater than, nor as great as, it is in clean appendicectomies.

Honestly, I do not see what is gained for the children by the present method of forcible manipulation except for that small proportion, 10 per cent., that gets the anatomic and functional perfect result; and this result could be gained more easily and with less risk by the arthrotomy method, so that the value of this 10 per cent. is not its face value. Nor can I see any reason in an argument against an aseptically made incision to clear away the obstruction and permit the easy access of the head to the acetabulum, a goal that is so strenuously struggled for in the manipulative method. It seems to me to be sensible to really reduce the dislocation when we set out to do so, and choosing a more difficult and devious instead of an easier and more direct method is very much like making a stunt of a surgical procedure.

My own list of cases, which I have done by arthrotomy, is a modest one, and would not have been reported until it was longer and older had it not seemed to me to be right to speak directly to this question now.

There have been 28 hips in 20 children submitted to reduction by arthrotomy.

The oldest was eleven years, the youngest was ten months. Between these ages there were three in the second year of life, three in the third year, five in the fourth year, two in the fifth year, one in the sixth year, one in the seventh year, one in the eighth year, one in the ninth year, and one whose exact age is not known, but as I remember it must have been about six.

In each instance the femoral head has been put into the acetabulum, cartilage to cartilage. Seventeen hips are known to be in stable position, with the head in the acetabulum, at times varying from two months to six years after the operation. In those children who were operated upon earlier in life—below seven years—there is ample range of motion at the hip, so that they can sit down, and can go up and down stairs, and can run and jump. There is in these younger children no tendency to ankylosis. In those who were older there has been a tendency to ankylosis which has had to be combated, or else a practically immobile hip has resulted. This may be a permanent condition or the joint may work loose, the final result depending more on the disposition of the child—for the active child will develop motion when the passive child will not—than upon any condition in the hip. I have seen the same thing in the old Lorenz operation; a child whose hip remained fairly rigid, having only what we call "shake motion," for many months would slowly work itself loose and have finally an ample practical range of motion. Eight hips are known to be subluxated or reluxated, and the times of observation are about the same as in the group just cited. In three hips the final result is unknown.

Some of the hips that reluxated did so, I feel sure, because of too short a time in the plaster-of-Paris, and consequently the hips of more recent operation, where splint restraint has been continued for a longer time, seem to me to promise better results. Surely the twelve and eighteen months old cases are, at present, very satisfactory.

In two of these cases there was a *slight Staphylococcus albus* infection of the skin incision. No case has had any infection of the deeper tissues. In one case, one of the older children, the skin of the perineum was torn and there is a paralysis of the muscles of the leg. The attempt at reduction in this child had risks which were acknowledged before the operation and the attempt was made reluctantly. It has succeeded, the head is in the acetabulum, the perineal wound has healed, but the paralysis has not yet receded. It is known, however, that this paralysis occurred after the accomplishment of the reduction and at the time that the knee was extended, so that it is fairly reasonable to expect it to recover in time.

With the exception of these items there has been no casualty of any kind in this series of cases.

There is still another word to be said. I took one of the anterior transposition cases of Doctor Lorenz's and tried to accomplish reposition by arthrotomy. My incision found the head in a subfascial extraarticular location and surrounded by a pseudocapsule; the cartilage on the head was eroded. The true capsule it was not possible to identify, excepting that part of it which was attached to the acetabular rim. It was very plain that in the forcible manipulation the capsule had been ruptured and the head thrust through the rent. It is to be remembered that in the Lorenz method there is a time when he does what he calls "stretching the anterior part of the capsule." At this point in the procedure the limb is wholly abducted and the head well jammed down over the acetabulum. In this position the knee is carried well backward and the head lifted from the bone, the shaft being a lever and the fulcrum the side of the pelvis. Just what the act would accomplish if the head were in the acetabulum I do not know; but when the head has been pushed down past the too small opening in the capsule and held firmly against the lower part of the upper portion of the capsule, which must be stretched very tightly, it is easy to understand that a rent would not be difficult to make, and a continuation of the prying motion would carry the head through it. The point that I wish to make is that this laceration of the capsule precludes the possibility of a successful reduction by arthrotomy. And the further point is that those of us who attempt reposition by manipulation must be guided by rules analogous to those that govern taxis for a strangulated hernia. Do not attempt the procedure if another has attempted and failed. Do not push the effort beyond a certain short time. Do not use force great enough to tear any part of the capsule, for you have no way of telling what part you may be tearing, and you may not only fail of manipulative reduction but may also spoil the hip for an arthrotomy.

The technic of the operation, as I have come to do it, is as follows: The child is placed on the table with a sheet, rolled diagonally into a soft sort of rope, between the thighs. The ends of this rolled sheet reach up beyond the child's head and are attached to a stout ring in the wall of the room. The part which is between the thighs is wrapped with a wet sterile towel, and arranged so that it lies directly under and across the ischial tuberosity of the side on which the operation is to be done. It must not lie across or cover the genitalia. This sheet gives a safe and sufficient counter traction in case any amount of force is needed to pull the femoral head down to the level of the acetabulum.

Around the thigh, just above the knee, is fastened a skein of yarn, by a clove hitch, and another is put around the ankle in the same way. Traction on either or both of these is permissible, up to limits which seem safe, and that without injury to the skin.

A moderate pull is then made on the leg, which draws the femoral head down from its usual location on the dorsum of the ilium, and brings it to just below the anterior superior iliac crest, where it is easily palpable. The incision advised by Lorenz is then made, cutting skin, subcutaneous fascia, fascia lata and finally the muscles, and all in the direction of the muscular fibres so that these are separated and not cut. This exposes the capsule and it is incised in the same direction, showing the femoral head inside it. Deep retractors have been used to hold the tissues apart, but now long loops of catgut are put in either side of the incision in the capsule, and they act as retractors. In older children it is right to do a subcutaneous section of the adductor tendons close to the pubes.

The pull on the leg is now relaxed, the femoral head goes up and the gloved finger is slipped into the capsule and down toward the acetabulum. Very rarely indeed will it be able to enter the latter, though flexion of the hip relaxes the anterior part of the capsule, and so makes the opening somewhat larger. On the finger as a guide a long, straight, probe-pointed bistoury is passed into the acetabulum and while the finger in the wound presses its edge downward against the lower part of the capsule, the hand on the outside slowly saws the knife to and fro. The cut thus made must be close to the femur and must especially avoid the anterior part of the capsule. Care must be taken not to cut off the ilio-psoas tendon, but the incision must be ample enough to give free access to the cavity of the acetabulum.

Now the femoral head is again pulled down from the dorsum of the ilium, by hard traction on the leg or on the yarn skeins, or, in older children, a tackle of blocks and rope may be used to overcome the resistance of shortened muscles and fascia.

When the head is over the acetabulum it may, in some instances, be thrust into the socket by firm pressure inward over the trochanter. Sometimes this maneuver has to be combined with abduction of the leg, made while the traction is maintained, the operator pressing the while firmly on the trochanter and supplying a fulcrum so that the head may be made to travel downward and inward and jump over the acetabular rim into the socket. There is one objection to the traction, for it makes a pull on the anterior fibres of the capsule and narrows the opening, and so occasionally one finds that, after reasonable efforts at it, in which the capsule has probably become somewhat stretched, flexion of the hip and manipulation of the leg—the direction of the movements being guided by the finger in the joint—succeeds in slipping the head into the acetabulum with the use of no force at all. In not a few instances, in young children, two to four years old, this may be done primarily, without the preliminary pull on the leg.

In a fair proportion of these cases there is a twist of the upper part of the femoral shaft so that the neck and head look forward when the toes are pointed in the same direction. Whether this is the case or not can always be determined by radiograms, one taken with the toes pointing forward, and another with the limbs rotated out. If there is the twist forward in the bone, it will be necessary to compensate for it by rotating the whole limb inward during the manipulations to direct the head into the acetabulum. Once the head is in the acetabulum the limb is put into a position of abduction of from 50° to 90° and rotated in or not, as may be necessary. This position thrusts the head more firmly into the acetabulum and prevents reluxation. The two retracting catgut loops are now tied together to close the upper part of the incision in the capsule. The lower part of the capsule incision has, by the act of reduction, been carried so deeply into the limb that it cannot be reached to be sutured. Sutures are then put in the fascia, deep and superficial, leaving space for the insertion of a cigarette drain down to the capsule. Finally the skin is sutured and then both limbs and the pelvis are put into a double plaster-of-Paris spica. Even if but one hip is operated upon, both limbs must be included in the first retentive plaster dressing.

After forty-eight hours the drains are taken out, and if there has been no sepsis, the leg is left undisturbed for three months. If sepsis occurs it is right to reluxate to avoid an ankylosed hip.

After three months the spica is taken off, and the limb adducted somewhat and another spica put on, including only the leg of the side of the operation in the one-sided cases, but both legs in the double cases.

After another month or so this may be arranged so as to leave the foot free, and the child may then be made to walk in the plaster. After six months have elapsed the spica may be made only to include the thigh and pelvis, leaving the knee free. After eight or nine months the retentive dressing may be left off entirely.

IV.

A CASE OF DOUBLE CONGENITAL SUPRACOTYLOID DISLOCATION OF THE HIPS WITH CROSS-LEGGED PROGRESSION.

HENRY LING TAYLOR, M.D., NEW YORK.

A girl of twelve was referred to the writer last winter, on account of persistent cross-legged progression. She was very active and energetic and walked two miles to school and back again daily; and this in spite of congenital deformities of both feet. The condition is shown in Figs. 1 and 2.

Examination showed the femoral heads over the acetabula just below and behind the anterior superior iliac spines, and the trochanters one inch and a half above Nelaton's line. Both legs were extremely everted. When standing, walking and lying the left leg was crossed in front of the right knee, though when lying the legs could be brought side by side, and even abducted a few degrees.

The right foot showed a severe stiff untreated varus, with a large bursa on the dorsum over the cuboid, where the weight was borne, and the left foot a stiff but less extreme valgus. There was also a knock-knee on both sides, worse on the left, with looseness and hyperextension.

As both hips held firmly without sliding in their dislocated position, it was thought best to correct the eversion and adduction by osteotomies below the trochanter minor. The right foot was first corrected by a Phelps operation with a plantar triangular flap, as recommended by Jonas; a great deal of force was necessary to overcome the deformity after section of all soft parts; the valgus was corrected at the same time by manipulation after division of the peronei. Subsequently osteotomies were performed, first on the left and later on the right femur, and the thighs moderately abducted and inverted. The thighs could be brought parallel, but not crossed after the

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correction. The left knock-knee being considerable it was forcibly corrected.

The condition subsequent to treatment cannot be reported in full, as the child unfortunately took scarlet fever and was removed from the hospital while still in plaster.*

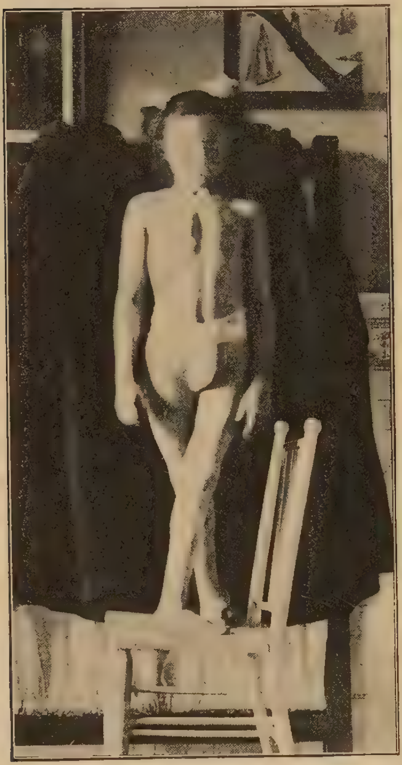

FIG. 1.

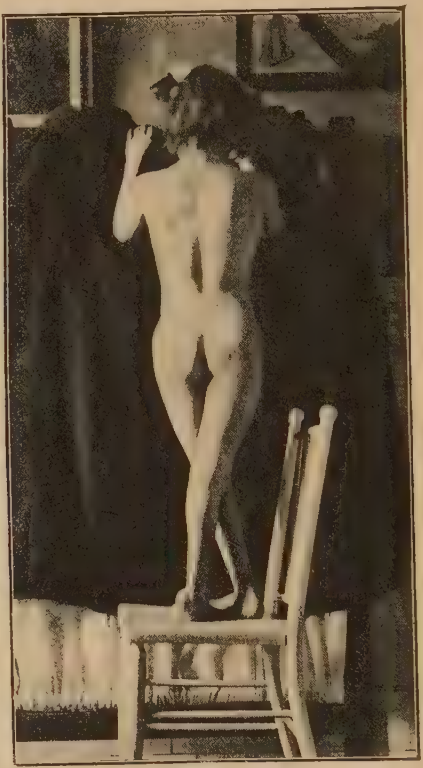

FIG. 2.

Cases of congenital upward dislocation are not very common, and the association with congenital foot deformities is not usual, but the principal interest of the case lies in the well-marked and effective cross-legged progression, which is exceedingly rare in congenital hip cases.

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* The patient convalesced well from her scarlet fever, and was discharged with all deformities corrected, and walking nicely. The angle of greatest abduction between the thighs was about 50°.

In this case it was no doubt due to the great amount of adduction, but possibly in part, to more favorable use of the deformed feet when crossed.

V.

THE DISADVANTAGES OF THE FROG POSITION IN REDUCED CONGENITALLY DISLOCATED FEMUR.

E. H. BRADFORD, M.D., BOSTON.

The number of relapses which follow successful reduction is so large that it challenges careful study of the after-treatment. Leaving out of consideration those resulting from imperfections of the head of the femur, the shallowness of the socket, the folding of the capsule in front of the femoral head, and femoral twists, there remains the possibility of other causes and it is the purpose of this paper to show that relapses may follow from purely mechanical reasons, even although the hip may have been thoroughly reduced, the head well placed in the acetabulum and surrounded by a fairly normal capsule.

If a reduced hip be placed in the so-called "frog position" and an X-ray is taken it will be seen that the position of the trochanter is below the line of the femur as a result of the forced rotation of the leg outwards with the flexion of the knee. If there is a femoral twist the position of the trochanter will vary from the normal one, but in any event the trochanter points downward as the leg is brought in a straight position. The trochanter would, if the leg were twisted forcibly out, point toward the inner side of the body, or behind the plane of the femoral head, as the foot, however, is turned in, the trochanter rotates towards the normal position which is to the outside and in the same plane as the femoral head. Where the socket is normal and there are no impediments to the rotation of the head in the socket, the trochanter moves about in an arc of a circle, the center of the acetabulum being the center of motion. This should take place normally after the reduction of a congenitally dislocated hip, provided there were no obstructions

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to this motion from the adjoining tissues. It may be assumed, however, that certain resisting structures to this rotation of the trochanter will be found to exist in a number of cases. This resistance will be not only from any anomalous fibrous bands, or from such cicatricial tissues as may follow the laceration of reduction, but may also be due to shortening of some of the pelvic trochanteric muscles which take place by shortening while the limb is kept in the frog position. These muscles are the pyramidalis and the obturators which, though not muscles which will under ordinary circumstances prevent the rotation of the trochanter, yet are muscles which it may be reasonably supposed would shorten and lose their elasticity after several months confinement in an abnormal position. It may be assumed, therefore, that shortening of these muscles is not only a possibility but a probability, if the limb is confined in a frog position for any great length of time, and if these muscles have any strength an impediment to the normal rotation of the trochanter will exist. If this resistance is at all a strong one the effect of it can be easily understood in cases where the capsule has not developed great strength, for, if this resistance to the normal rotation is greater than the strength of the capsule, attempts either sudden or gradual to bring the limb from the frog position to the normal standing position would necessarily throw the head of the femur upward and forward in that presenting what is known as anterior transposition.

This shortening of the pelvic trochanteric muscles already mentioned, can be prevented in a measure by manipulating the limb while in a plaster-of-Paris bandage, as has been recommended by Drs. Muller and Ashley, but complete rotation of the trochanter and stretching of these muscles can not be accomplished without removing the limb from the plaster and placing the limb in as nearly a normal position as possible. It would appear, therefore, that it is desirable to remove the limb from the frog position as soon as possible and that there is a great disadvantage in retaining the limb in a position which demands so much elasticity on the part of the pyramidalis and obturator muscles.

It is a common experience in reduction of congenital dislocation of the hip to find that, although the head has been placed well in the acetabulum, when the limb is strongly flexed and abducted, if an attempt is made to bring the limb into the normal position parallel to the vertical axis of the body with the foot turned to the front, that the femoral head is thrown out of the socket before the limb has been brought to the desired position. This occurs even after the muscles usually considered have been thoroughly stretched. It cannot be due to the abductor group, or to the hamstring group; it is not probable that it is due to the psoas and iliacus nor to any portion of the capsule, provided the latter has been thoroughly stretched. The probability that this tendency may be due to a shortened condition of the fascia lata and especially the ilio-tibial band is one that demands attention the more the anatomy of the hip is studied. The fascia lata surrounds the whole of the thigh, but is strongest on the outer side, presenting a sheet of ligament which passes from the crest of the ilium down the outer side of the thigh, and being inserted, as the ilio-tibial band, at the head of the tibia; it passes well to the front and receives muscular reinforcement from the tensor vaginæ femoris and a number of strong fibres of the gluteus maximus. The strength of this fascia in young children is not sufficiently great to be considered as a factor of importance in the reduction after the head has been forced into the socket; the use of the femur as a lever with the upper edge of the acetabulum as a fulcrum will be sufficient to stretch the fascia lata so that the limb can be brought into the normal straight position. In the older and more resistant cases, however, this mass of ligamentous tissue, which of course is shortened in congenital dislocation of the hip, presents a strong resistance. These are eliminated as factors in reduction by abducting the thigh and flexing the limb at the knee; if, however, the limb is placed in the frog position the fascia lata is not only not stretched, but is in a position to become shortened and the stronger portions of it on the outer side will offer a strong resistance to the placing of the limb in the normal straight position. Where this sheet of fascia is firm and short any attempt to straighten the leg will necessarily be followed by a re-dislocation of the femoral head unless the fascia has been stretched to its normal length.

In order to prevent a shortening of this fascia lata after reduction which it would appear must necessarily follow in the frog position, it would seem that what might be termed the reverse position with the foot turned forcibly inward has certain advantages. It is, of course, essential that the limb after reduction should be kept in an abducted position in order to counteract spasm of the adductor group. If the abducted position is kept with the foot turned strongly inward, and if rotation of the femur is present, the trochanter will be brought from the posterior to the normal position and will act as a firm pressure point upon the fascia lata as it passes from the crest of the ilium to the tibia and in this position will act as a means of stretching the fascia lata as the leg is brought from abducted to a straight position, provided that the trochanter is not allowed to slip backwards when, as occasionally is the case, it is advisable to place the hamstring group in such a position that they will not, by spasm, endanger the reduction. The knees are necessarily flexed and if retained in this position it is impossible for a child to walk; in fact, locomotion is difficult if the limb is placed in a position with the feet turned strongly inward. The question, therefore, in after-treatment of these cases, arises whether a greater risk is run by foregoing the weight-bearing function of the limb as a method of after-treatment, or preventing a contraction of the fascia lata by the normal pressure of the trochanter gradually bringing the limb from the strongly abducted to the straight position.

This is a question which can only be answered by carefully collected experience. The writer simply records his impressions from several cases treated in a position with the foot turned strongly inward, that the advantages of this position appeared to be greater than those gained by the weight-bearing function offered to a very limited extent by the frog position.

VI.

PROFESSOR LORENZ'S OPERATION FOR THE REDUCTION OF CONGENITAL DISPLACEMENT OF THE HIPS.

E. NOBLE SMITH, F. R. C. S. EDIN., M. R. C. S. LOND.,
LONDON, ENGLAND.

Our personal thanks are surely due to Professor Lorenz for his work in this important subject, and I am glad to take this opportunity of expressing my appreciation of the masterly manner in which he has demonstrated the details of his procedure.

As to the exact value of his method of dealing with this affection opinions may differ, but there can be no doubt whatever that he has worked at the subject in a scientific and practical manner, and brought to bear upon it his mature experience and honesty of purpose.

Great credit is doubtless also due to Professor Paci, for the part he has taken in elucidating problems bearing upon this subject, but as I am more practically acquainted with the work of Lorenz, and have had the advantage of watching his procedures closely, and practising them myself, I must for the time confine my remarks to the latter's work.

In a treatise upon this subject one would mention a great many other names, not forgetting Carnochan in America, and Adams in England, but if I were to attempt a complete history of the subject, it would be necessary to go back to the time of Hippocrates. I take it that at the present meeting of those who are about to discuss the matter, a great many are well aware of this history, and are not inclined to occupy themselves with facts that are of the past, their main object being to elucidate the practical points, and to solve the question, if possible,

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Presented by title at the Eighteenth Annual Meeting of the Association, at Atlantic City, N. J., June 8–10, 1904.

how to deal with congenital displacement of the hips to the patient's greatest advantage.

I have always maintained that the most important point for consideration is the condition of the affected joints. In considering this state of the joints I think it will perhaps be best to confine our consideration to the clinical aspects, deferring for the time being the pathological, because we have not sufficient evidence as yet to be able to compare the one with the other. It may be for instance that in those cases where there is great difficulty in reducing the displaced head of the bone, an hour-glass contraction of the capsule exists causing the impediment, and that when reduction can be easily effected, then this contraction is absent. Personally I hardly think this suggested explanation holds good, but undoubtedly differences do exist. For instance, one of the cases which I shall record, a girl aged five and a half, with double displacement, in which manual examination and the radiograph showed very little difference on the two sides except that the right seemed displaced a little more than the left. Upon attempting reduction at the time of operation, the *right* was reduced almost immediately, there being very little resistance, whereas with the *left*, after nearly half an hour's careful manipulation the head of the bone, although improved in position, was not reduced. Since then I have made in this patient several efforts to complete reduction, and have failed to do so thoroughly, although the head of the femur is now apparently on the posterior margin of the acetabulum. This is the only case, however, that I have had of failure at complete reduction in young children.

(Since writing the above I have made another attempt and have still further improved the position. I hope yet to complete the case satisfactorily.)

Whatever the condition of the joint may be, reduction of the displacement will most probably have a good effect even if the head of the femur fails to pass through the contracted neck of the capsule (if present) or in other ways is prevented from assuming absolute contact with the acetabulum. The pressure of the head of the bone directly inward will lead to absorption of some of the intervening tissues, and to the formation of an adventitious cavity.

In proof of this probable result I have already (in my paper communicated to the Fourteenth International Congress of Medicine at Madrid, April 25, 1903) given evidence of pathological specimens showing that a very good acetabulum may be formed when the hip-joint has been dislocated traumatically, and remained unreduced a long time.

As an example of a newly formed joint I give Fig. 1.

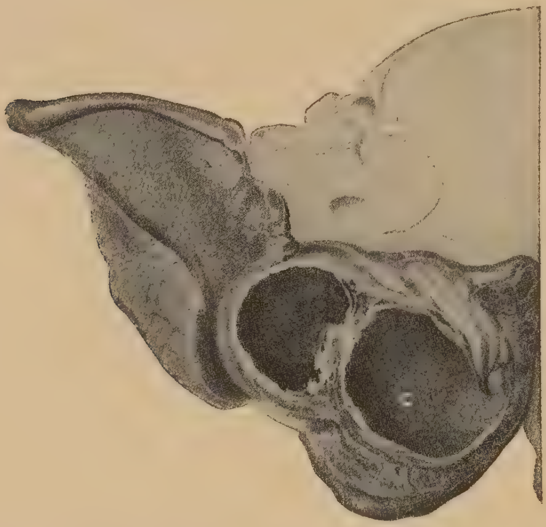

FIG. 1.—Reduced copy of a figure (Plate III) in Sir Astley Cooper's "Dislocations and Fractures of the Joints," published in 1826. It represents "a dislocation into the foramen ovale which had never been reduced"; the new socket (c) had been formed, allowing "a considerable degree of motion." This new socket held the head of the femur firmly. "It was lined by a ligamentous substance." Museum, St. Thomas's Hospital.

If the joints are so loose that they can be moved about freely by manipulation it is obvious that if we allow the child to grow up without treatment of any kind (including treatment by posture and recumbency), there is no doubt the deformity will prove to be considerable and the child will develop in a very unsatisfactory condition. The weight of the body must increase the displacement to a very considerable extent before any fixation of the parts occurs. If upon the other hand, the joints are slightly displaced, and not inclined to give way to ordinary manipulations, that is to say, if in the surgeon's judgment there is no great tendency to increased deformity, then it is quite possible the child may grow up without any great detriment in after life.

In forming our opinion as to treatment, the question of age has to be considered. In a young child say from two to five or six years old, although the joints may not seem very loose, yet it would surely be desirable to make an attempt to reduce them.

It is the period between seven and twelve years of age which is the most momentous time for forming a decision on these points, and this decision must be left to the discretion and experience of the surgeon.

DISCUSSION.

Dr. **John Ridlon** referring to the paper of Dr. Lorenz and question of the diagnosis of the condition by means of the X-ray, with reference to the possibility of replacement or inability to do so, said that he did not believe that much reliance was to be placed in X-ray pictures. He was in grave doubt regarding the value of the X-ray as a means of prognosis in respect of the permanency, or otherwise, of reduction. In examining afterwards, for final results, one cannot tell by clinical examination whether the replacement is perfect or not, nor could he tell by the use of the X-ray. He has X-ray pictures that appear to show perfect replacement when the head is positively in an anterior position. He has cases which from physical and clinical examination seem to be perfect, yet the X-ray picture shows the head above the acetabulum. Only by a combination of both clinical examination and the X-ray can we determine whether or not the result is an apparent or real anatomic one. There may be an anatomic replacement, with the less perfect functional result that occurs in another case where there is no anatomic replacement. A functional result and perfect anatomic replacement have no direct relation. Professor Hoffa informs us that the older cases are not for the bloodless method. Dr. Ridlon is unable to understand whether one is to expect a better result from a cutting operation in an older patient than from the bloodless operation. It is not the fact that the patient is old or young that makes the bloodless operation, any more than the cutting operation, impossible. It is not the shortened muscles that prevent the reduction. The shortening of the blood-vessels and nerves is the serious obstacle to reduction and they cannot be lengthened by the cutting operation any more than they can be by the bloodless method. He cannot see why one is not as likely to get paralysis in a cutting operation, unless the bony structures be shortened, as from the bloodless operation. As to the narrowed capsule and the impossibility of putting the head deeply into the acetabulum, he thinks it likely that Dr. Sherman is quite right, and that, in such cases, it is only an apparent replacement at the time of operation, and not a perfect replacement. Perhaps in one case out of every 29 the capsule is large enough to admit the head. He has seen no X-ray pictures from cases that showed the head immediately after the operation as perfectly in the acetabulum as the normal head. Perhaps only once in 20 or 30 cases is the head placed deeply in the acetabulum, but he thinks that, generally, it is not. The head may be placed in the narrowed cotyloid ring, and, if kept there for a sufficient length of time, will in some cases remain there, especially if the patient walks on it, and the manipulations, after the plaster is removed, are used wisely. Exposure to paralysis by the method suggested by Dr. Sherman seemed to him to be just as great as from the bloodless operation. Concerning the case which Dr. Steele has reported, which he believes to be a perfect replacement, because the child can run and jump as well as any other child, he believes that this is no evidence as to whether there is replacement or not. He has a bilateral case upon which he has twice operated which is a supracotyloid position at the present time, and yet the child runs and jumps with perfect strength, agility and comfort. The function and ability to do things has nothing to do with settling the question of replacement. That condition referred to, in which the great trochanter appears to be in the acetabulum is not uncommon. When the leg is brought parallel with the middle line of the body, it becomes a supracotyloid dislocation. In some cases, at the time of operation, the X-ray pictures shows the great trochanter below the sciatic notch, and the head somewhere near the acetabulum. These cases may become perfect anatomic results. Dr. Sherman argues that all such cases have torn capsules and that the head is out among the muscles. This, Dr. Ridlon thinks, is a mistake.

Dr. H. Augustus Wilson said that anyone who is familiar with the tricks of ordinary surface photography must reach the conclusion that radiographs so far as congenital misplaced hips are concerned are valueless. No instruction is given to the radiographer who is unfamiliar with orthopedic surgery, and all kinds of conceivable tricks can be, are, and have been, performed by means of the X-ray. Dr. Wilson has definite positive knowledge of two cases where the radiographs showed every condition favorable to reduction. In both cases there was no head whatever to the femur. The attempts to reduce the head were based largely on the radiographs and during the process it was found that there was no head present. Very much to his surprise Dr. Ridlon in examining his cases found one of these cases in which there was no head present. Unless one knows definitely from clinical inspection the orthopedic aspects of the bones around the joint, the X-ray will be only a source of confusion. The solution of the difficulty, he believes, lies in observing the proper manner of taking a radiograph. Alone, the X-ray is valueless. They are of interest and they do help and confirm the results of clinical inspection.

Dr. Porter said that he had seen two cases that seemed to him to be important because of the unfortunate after-result. One case had been reduced or transposed by Lorenz on his second trip and the other had been done by a general surgeon assisted by Dr. Porter in Chicago. Both of these cases have dislocation on the other side. It does not seem possible that Lorenz could have overlooked a dislocation of the other head, but it was supposed to be at the time a single dislocation. Dr. Porter is satisfied that the case upon which he operated with the surgeon was single at the time it was reduced on one side. Now the X-ray shows a dislocation on the other side. It may be possible that the use of the leg in the altered position has resulted in a dislocation of the well hip.

Dr. DANE reported a case operated upon by Lorenz when in Boston, which when the plaster was removed from the child was found to have a dislocation on the other side. This hip evidently became dislocated during the treatment.

Dr. GALLOWAY wished to know the attitude of those present in regard to deepening the acetabulum, and whether or not they considered it a justifiable procedure. With regard to arthrotomy he would be glad to learn something of the after-treatment and the position of the limb.

Dr. PECKHAM thought it might be interesting to collect statistics of adults who have congenital dislocation of the hip. He sees cases every year in which this condition is present where there is no trouble whatever from the condition. One case of a boy with one inch shortening came to him where there was doubt on the part of the parents whether the boy limped or not.

Dr. ANSEL G. COOK, of Hartford, Conn., said he had seen a woman with congenital dislocation of both hips, who had a child in the same condition. The dislocation had given very little trouble to the mother and was regarded as a trifling matter. He had operated on but one patient, a child two and a half years of age; the dislocation was single and very severe, the child walked, or rather got over the ground, with great difficulty. The head of the bone went up to the crest of the ilium. He had, previously, put a hip splint on the patient and it had been worn for nine months. Under ether the tendons were stretched and the bone replaced in the socket, that is, it went where the acetabulum ought to be. It seems to him that too much stretching, as a preliminary measure, is not advisable.

At the end of six weeks the plaster cast was removed and the head was found to slide in and out of place. The leg could be thoroughly abducted. At the end of three months, the cast was again removed, the joint examined and this time the head remained in place. Another cast was applied. Four and a half months after the operation the child walked without trouble.

The third cast was removed one year, lacking two weeks, from the time of the operation. The child is, apparently, perfectly cured. The hip is a little stiff, there is a very slight limp but this seems to be passing away.

He believes that there is a future for this operation. It can be done in a certain number of cases. More attention should be paid to the preliminary treatment.

Dr. Cook thinks we should treat congenital dislocation of the hip as we do club-foot, keeping the patient under observation, if necessary, for three years.

Dr. T. HALSTED MYERS of New York said he was interested in the subject of paralysis occurring in connection with operations for the reduction of congenital dislocation of the hip. Formerly he had used Paci's method and had no paralysis. Since using the Lorenz method he had had one case of peroneal paralysis which fully recovered in three months, and one case involving all the muscles below the knee. This showed return of power in the flexors at the end of three months and was still improving, though there was still marked weakness of the extensors at the end of eighteen months. What particular manipulation is it that causes the paralysis? Dr. Myers had in these cases stretched the different groups of muscles in the order usually adopted by Lorenz. After the adductors were stretched fully, the posterior group was stretched by flexing the thigh with leg fully extended. In some cases the leg was not extended until after the thigh had been flexed. Dr. Myers thought this latter procedure might produce more direct strain on the peroneal nerve than the former and so be more likely to cause this paralysis.

Dr. **Myers** wished to know the opinion of the member as to the earliest age at which it was advisable to use these plaster casts.

Referring to Dr. Sherman's cases where it would have been impossible to reduce the dislocation without arthrotomy, he mentioned two cases in which he had reduced the hip three times and each time on removing the splint for trial relapse occurred. On opening these joints the capsule was found very thick and the hour-glass contraction absolutely prevented proper reposition of the head. At the previous attempts he had simply reduced the capsule in front of the head. The cutting operation has resulted in firm reposition.

Dr. **Henry Ling Taylor**, of New York, said that most of his cases had resulted in anterior transpositions. His best result had been obtained in a case reduced before Lorenz had visited this country. The manipulations in this case had been less severe, and the position less extreme than those operated since. The case referred to has been out of plaster for about one year and the legs are of equal length. The radiographs show the head well in the socket. The gait is excellent.

Dr. **Hoffa** in closing said that each one would be guided by his own experience. His own experience teaches him to try the bloodless method in young children. In 30 per cent. of unilateral cases one may expect a good result. But why shall we stop with this and try no other treatment? In young children where the open operation has been used, even with deepening of the acetabulum, there had been no fear of ankylosis. He has operated upon many such cases. Ankylosis only occurs in the older cases. Upon such cases he does not operate for reduction but does some prophylactic operation. He does not wish to make patients worse in an attempt to make them better. Sometimes it seems that all we have learned from the open operations is forgotten as to the deformity of the head and neck. All is now the bloodless method. He takes the method which succeeds best. Dr. Ridlon is quite right. The dangers of paralysis in the open operation are equally as great as in the bloodless reposition, but when one does the open operation one knows that he has the head in the right place.

Dr. **Sherman** said that the statement of Dr. Hoffa that "in the cutting operation one knows that he has the head in the right place" settled the question of the merits of the two methods. In his early cases he enlarged the acetabulum, and the head either slipped out, or the joint became ankylosed as granulation tissue springs up from the denuded cancellous tissue and clings around the head. Appreciation of this fact made him abandon deepening the acetabulum. In the consideration of Lorenz's cases he thought that when the head was in a position where it would otherwise be impossible for it to go normally it must have been thrust through the capsule. The cases operated upon by Lorenz in San Francisco were bad results and after his experience with me, at a cutting operation, he did not believe they could be improved even in that way, as it was impossible to put the head in its place inside the capsule. In the radiograms which Ridlon showed him as perfect anatomic results there was a serrated irregular end to the neck with no definite head. This Ridlon himself called his attention to and said that he could not explain it. That part of the bone which had been stuck out of the capsule Dr. Sherman thought was entirely gone. This may be, of course, a poor hypothesis. However in every picture that he had seen, where manipulative reduction had been used there was a certain space between the shadow of the nucleus of the head and that of the acetabulum. If one cuts into the joint and brings about replacement one does not get such a shadow with such a space. In one-sided cases, so operated upon, it is sometimes impossible to tell which had been the affected side. There is as close a contact as is possible, with cartilage to cartilage. It seemed to him that paralyses are more likely after manipulations than after a cutting operation.

Dr. Hoffa said that his cases were selected. Only in one of his cases treated by manipulation did he have a fracture and that was done by one of his assistants. He has had paralyzed legs and has had abundant injuries as a result in his early old cases. Given a case of a girl four years of age, he makes the reposition gradually and brings down the head only as far as possible without force. After eight days it will usually go in without difficulty. It is absolutely sure that the head can be easily entered into the capsule after a preliminary operation. He brings the head into the acetabulum from below in a manner differing from the method of Lorenz. He takes the leg and handles it like the handle of a pump. Hyperextension first making circumduction and the head goes in from below. If reposition is made in this way no injurious results will follow. None of his cases have been damaged. Only when forcible attempts are made do we have paralysis. The after-treatment consists in the application of plaster-of-Paris with the X-ray always to watch the progress. If reposition is not accomplished or cannot be done, do the open operation. Lorenz has described an arthrotomy with which he has obtained very good results. Hoffa has treated children as young as eighteen months. In unilateral cases of congenital dislocation of the hip the acetabulum will be shown by the X-ray to be exactly the same as the other acetabulum, flat and oblique. One can easily understand that when the child walks in the abducted position the head may slip easily and dislocation occur on the other side. Sometimes the ligamentum teres is as thick as the finger so that a reposition is impossible because of a folding in of this ligament.

Dr. Steele asked why it would not be possible for a capsule caught between the head and the acetabulum to become absorbed.

Dr. Hoffa said that this would be impossible. Such a thick capsule cannot be absorbed. This has been tried in the case of a dislocated thumb where the capsule of the joint has been caught between the ends of the dislocated bones. After remaining there for five or six months the capsule remained unabsorbed. In the case of older patients with spontaneous dislocation the head of the femur is quite gone or much smaller and the angle is more nearly a right angle. These patients often have great pain. The condition is often diagnosticated as tubercular hip disease. The simplest and easiest treatment is to do a subtrochanteric osteotomy, making quite an oblique incision. Cut the abductor muscles which are much shortened. Slip the bone downward so that the false position of the leg can be corrected. Hoffa corrected a shortening of 5 cm. The result of the operation will be a disappearance of the pain with increased function of the leg. This is the treatment for unilateral cases. In double cases the head is entirely removed. The soft parts are scraped away from the ileum to the osseous surface. Ankylosis never happens but a pseudarthrosis is the result. He has done this operation in more than 50 cases and the results have been very good. Many of them are married and have children. There is a diminution of the lordosis, the legs are parallel and can be separated.

Dr. Sherman stated that he used plaster-of-Paris which held the leg flexed, abducted and rotated in slightly. The patient is kept in this position for two or three months. The limb is then brought down and the leg extended, but not adducted much if any, and it is kept still rotated in somewhat. The later splints include the ankle but does not reach the foot. At the end of six months the child is put on its feet. The splint is carried to the ankle for the first six months. After that it reaches only to the knee. He first made the mistake of allowing the patients to be about too soon. The treatment should include anywhere from six to eight months in the splint.

VII.

A NEW METHOD OF RECORDING ROTATION IN SCOLIOSIS.

R. TUNSTALL TAYLOR, B.A., M.D., BALTIMORE.

The author would suggest the following method to determine the angle of rotation in scoliosis: The patient is made to lie prone on the examining table, the face turned to the left in right dorsal scoliosis and to the right in left dorsal curvature, with the arms at the side, palms of the hands down and the elbows as close to the body as possible.

A yard stick is placed across the spine at the point of greatest rotation with its center at the spinous process of that region; the vertical distance from the two extremities of this stick to the examining table is then measured by a graduated rectangular triangle, such as one may obtain at a store where drawing instruments are sold.

Now in a symmetrical back these two extremities would be equidistant from the table or ground and the difference between the two, in distance from the table, in a rotated spine, would give the side of a rectangular triangle opposite the angle to be determined, if we imagine a plane parallel to the normal back plane or to the table as one side of the triangle.

The normal plane of the back may be easily determined in a rotated spine as it is the same distance below the upper extremity of the yard stick that it is above the lower extremity of it.

Suppose a beam to be perfectly balanced at its center, each end would be equidistant from the ground; this we may call the normal plane of the back. Now suppose this beam is rocked on its central point of balance, which would occur in a rotated spine, one end will be as much above the normal

Presented at the Eighteenth Annual Meeting of the Association, at Atlantic City, N. J., June 8–10, 1904.

plane as the other is below it, and the diagonal angles opposite made by the intersection of the rocked beam with the normal plane will be equal. As the normal plane is parallel with the ground, any angle formed with it, or any parallel plane, will be the same as that formed with the ground. Now this can readily be applied to the rotated scoliotic spine in a prone position, for when any angle is made by the rotated spine with the normal spinal plane the same angle is made with the examining table or any plane parallel to it, as is well known from geometry "alternate interior angles are equal" (Fig. 1).

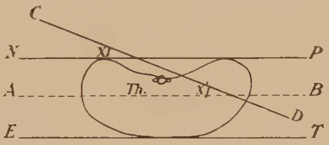

FIG. 1.

Th. = normal thorax.
N P = normal plane of the back.
E T = examining table or ground.
A B = any plane parallel to N P and E T.
C D = any intersecting plane with N P and A B.
X = X^1 or any corresponding angle made with E T or N P.

Now to apply the yard-stick method to the rotated spine:

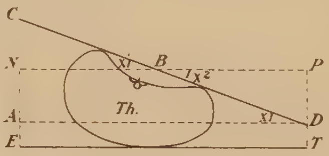

FIG. 2.

Vertical distance C N = P D, as C B = B D.
C E–D T = C A = one side of a rectangular triangle.
Now C A is the side opposite the angle (X) of rotation sought.
$X = X^1 = X^2$.

In Fig. 2 C D represents the yard stick or plane of the rotated spine with its center at B, the spinous process and E T the examining table or floor. Suppose C E is a longer vertical distance than D T (as determined by the graduated rectangular triangle);

now by subtracting D T from C E leaving C A and projecting an imaginary plane from A to D the line A D is parallel to E T naturally, as it has been drawn through two points equidistant from E T; further, C A D is a right angle, as C E T was and the distance C A is the side of a right-angled triangle opposite the angle of rotation to be determined or the identical angle the plane of the rotated spine would make with the examining table or a prolongation of its surface.

Now if C E should equal D T, C D would be parallel to the examining table, coincide with N P and no angle would be made naturally and C D here would equal the normal plane of the normal back.

If on the other hand C E should be 36 inches longer than D T we would have the yard stick vertical to the examining table and the angle of rotation of the spine would be 90°. From these two extremes it is easy to construct a working rule.

If the distance in inches between C E and D T is..	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36
The angle in degrees is....	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90

Now in order to facilitate the working of this method the author has graduated the sides of the rectangular triangle in inches and had the above table put upon its hypothenuse. A small metallic arrow has also been put at the center of the yard stick for convenience in having it touch the spinous process of the point of maximum rotation.

Of course we all bear in mind the great difficulty of obtaining exact records of the rotation in scoliosis from the natural tendency for the body to assume dissimilar postures on different occasions when records are desired, but whether we use the ancient lead tape for tracings, or the weight bar and plumb of Bradford, or complicated machines such as those of Demeny and Schulthess, we will encounter this same source of error.

The method is not claimed as a perfect one and free from error, but its simplicity of application and the cheapness of the necessary instruments recommend it. Two or more persons should make the readings and the means taken to eliminate error. Further, from the fact that the patient is to be prone, with the face always turned to one definite side, the palms of the hands down in contact with the examining table and the elbows as close to the sides as possible, the element of error at the varying periods of examination is minimized and while we may not obtain the most exact angle it is sufficiently accurate for comparison as a patient progresses or the reverse.

Under these conditions it is presented to the profession.

VIII.

A SIMPLE AND RAPID METHOD OF RECORDING THE LATERAL DEVIATION OF THE SPINOUS PROCESSES IN SCOLIOSIS.

ALBERT H. FREIBERG, M.D., CINCINNATI.

I venture to offer this addition to the large number of methods for making records in scoliosis, with no little hesitation. The attempt made by this society some years ago to establish a standard for measuring and recording scoliosis, seems to have had no definite result. Photographic methods seem to have held favor with many. Indeed, at first thought, photography would seem to be by all means the most accurate, the most convenient, as well as the most uniform of all the methods hitherto employed. It is the method upon which I relied for a number of years, and although thoroughly acquainted with all of its advantages, I have come practically to its abandonment, for this purpose.

There can be no doubt that the photograph, made with skill and care, gives the best possible idea of the appearance of the figure; this is in a general way only, however. As a means of accurate measurement it is decidedly deficient, both as regards exactness and convenience. If the picture be taken through a thread screen, it must be very large in order to show differences of one-eighth inch; yet this may with reason be expected of any method. It must, in order to be fairly accurate, be taken with patient and camera in exactly the same relations each time, and in the same light. Young children are maintained in the proper pose for a sufficient length of time with difficulty, excepting possibly in a well-equipped studio. All of these conditions are such as I have encountered in practice, and in spite of a good equipment. Many other objections might be added; for instance the necessity

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Presented at the Eighteenth Annual Meeting of the Association, at Atlantic City, N. J., June 8–10, 1904.

of developing the negative, of having the print made, and the loss of time which these processes involve. On the other hand, the methods which have been proposed as substitutes, involve either the use of complicated apparatus, in itself enough to prevent widespread adoption, or, they are deficient in convenience or accuracy.

The method which is here offered can be said to be rapid, simple and accurate; as eliminating the personal factor to the greatest extent. The relative importance of the record of the lateral deviation of the spinous processes it is not now proposed to discuss; for my part, I hold it to be of very great importance when used in connection with other carefully taken measurements. As it appears to me, the object of any method of recording the deviation of the spinous processes should be the reproduction of the curve drawn upon the back, with exactness, or its reduction to scale. The following is the means used to attain this end:

A piece of plate glass, say one-quarter inch thick, twenty inches long by six inches wide has a black line drawn through the middle of its length. Having drawn the line of the spinous processes upon the back by means of a skin pencil, the glass is now held against the patient in such a way that the black line cuts the vertebra prominens with its upper end and the fold of the nates below. By means of a pencil which writes upon glass (A. W. Faber's pencil for glass, china and metal), the curve is now qucikly drawn upon the plate, the only necessary precaution being to hold the plate steadily, and to sight carefully so that the central line is maintained in its proper position.

Having drawn the curve, the plate is now laid upon a board of the same dimensions, upon which there has been pasted a piece of cross section paper which is divided into squares of inches and eighths, of full size. Down the middle of this there is drawn a heavy line which is to correspond with the median line on the glass. The glass is superimposed upon the paper so that these lines coincide and the curve may be copied upon cross section paper of full size, or as I prefer, upon paper ruled in squares of one-half and one-sixth inch; the diagram is thus reduced to one-half size which is much more convenient for handling.

It is my custom to measure the deviation of the trunk upon the pelvis by dropping a plumb from the seventh cervical vertebra; the distance horizontally from this to the fold of the nates being the measure and this is drawn into the diagram before described. To this diagram there is added the measure of rotation, of the level of the shoulder and pelvic girdles, and we then have a means of comparison which seems to me the equal of those produced by the complicated forms of apparatus and at the same time calling for no materials which may not easily be in the hands of every one who treats these cases.

DISCUSSION.

Dr. G. W. Fitz of Boston, by invitation, said that he had devised a scoliometer which he had found could be used instead of the camera and screen. He uses a piece of transparent celluloid 14 by 50 cm. with longitudinal rulings 1 cm., and cross rulings 4 cm. apart. This enables one to measure and plot the coordinates of any or all points on the back, as vertebræ, scapulæ, etc., so that they can be recorded or plotted as curves, outlines, etc. Two spirit level glasses are applied at right angles so that one can measure vertical or horizontal deviations with great accuracy. The device can be used to determine the level of shoulders, ilia, iliac spines, etc.

In photographing cases he has found it to be a disadvantage to have any fixed foot position. He uses an inelastic string from the front of the camera to the patient to set him at proper distance. When depending upon the foot position there is sometimes as much as six inches swing of the upper part of the body.

Dr. Freiberg said that he thought this device to be commendable to the same degree as the glass device which he had showed. It can be used by anyone without incurring any considerable amount of expense. It cannot pretend to absolute accuracy. The reason is that in order to estimate the amount of rotation which has occurred we should have to find the highest point on one side and the lowest point on the other side. It may be impossible to reach the lowest point with a plain rod. As a means of obtaining the relative measurements of the same case the method should be satisfactory.

Dr. Henry Ling Taylor called attention to another source of error in the shape of the anterior wall of the thorax. Unless the anterior wall of the thorax be flat, the method will not be accurate. Usually there is a projection of the anterior surface of the thorax which will be a source of error. There is no reliable method for obtaining the horizontal plane. It seems to me that after all the simplest expedient is the use of the lead tape which gives as much information as any other method.

Dr. R. Tunstall Taylor in closing the discussion said that the measurements obtained by this method were used to determine in a given patient subject to the same conditions several months after whether there was any gain in that particular patient. If a patient be subjected to same conditions now and three months from now and the same measurements made by the same method, it will be possible to tell whether that patient is gaining or not. He agreed that there are regions of the spine where we cannot get into the lowest point. In taking the measurement the patient lies prone and the face is turned to the side of the concavity. The palms of the hands are downward flat on the table with the elbows as close to the body as possible.

IX.

A STUDY IN THE TREATMENT OF SCOLIOSIS BASED ON ANATOMICAL, PATHOLOGICAL, AND MECHANICAL FINDINGS.

R. TUNSTALL TAYLOR, M.D., BALTIMORE.

Few if any of us, up to recent times have held but one view as to the pathological changes in the bones, which take place in the vertebral bodies in an advanced case of scoliosis, namely that the side of the vertebral bodies corresponding with the side of the concavity is atrophied and the other or convex side is hypertrophied from displacement of the center of gravity in bearing the superincumbent weight of the superimposed structures, more on one side than the other.

This is the Volkmann-Hueter theory of pressure atrophy.

By atrophy and hypertrophy in a given structure, we understand a uniform change not only in size and thickness, but also in density of structure.

Not only in scoliosis, but in distortions of other portions of the bony frame-work, notably the lower extremities, as in knock-knees, was this widely and generally accepted theory applied. Thus in knock-knee it was claimed that the external condyle hypertrophied and was the *cause* of the deformity.

To that gifted investigator of Berlin, Julius Wolff, is due the credit of upsetting this theory and I think the majority accept his theory and findings.

From Wolff's observations it is easy to see and demonstrate by pathologic bone sections that neither is the external condyle of the knock-knee nor the concave side of the wedge-shaped scoliotic vertebra atrophied, but in reality it is more compact, dense and stronger than normal from the *increased* trabecular formation and the convex side is more porous than normal from the rarefaction of the bone trabeculas.

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It can be shown further that these changes are gradually and progressively produced by function adapted to altered weight bearing and if unchecked may lead to permanent and irreparable bone distortion.

In a beginning and flexible or partially flexible scoliosis, our duty, to my mind, is manifest, if we take heed of these facts, that *the weight bearing of that trunk should be so reversed* as to undo the pathologic trabecular arrangement and restore the normal.

Thus if a child has a marked but early right dorsal scoliosis, leans much to the right so that the shoulder tip extends way beyond the vertical side line of the trunk, the right shoulder is carried high and the left low and the ribs are rotated backward on the right, we are doing far from our duty, if we allow such a patient to maintain this vicious pathogenetic posture for twenty-three out of the twenty-four hours. In the remaining hour only, are we giving them corrective gymnastic exercises. Which of us, no matter how experienced, can say that by gymnastic and machine correction for an hour daily we can cure or even hold such a case from getting worse?

With the new light shed by Wolff are we not in a better position to antagonize these physiologic bone changes, which result from a perverted functional use of the spine?

If we have such a case as indicated above, can we not so strap the trunk of the patient with webbing and adhesive plaster *when she is not doing the daily corrective gymnastic exercises* that she not only should assume a corrected, but an overcorrected position which last is what *must* be striven for, until what we may term "trabecular balance" is restored in the vertebræ? Of course in a fixed curve such treatment is impossible and we must strive to make such a spine as flexible as we can by gymnastics and *active* machine correction and then maintain it in a corrected or overcorrected position by artificial means, as far as possible.

Of course, it will be said by patient's parents, "We brought you a child crooked one way and you have made her crooked in just the opposite way." If such a statement is made in the light of modern bone pathology, we should be well pleased, as we are then on the right track.

For some time in a blind way, except from clinical experience as a teacher, orthopedic surgeons have after operations on bowlegs and knock-knees obtained the best results in putting these legs in plaster-of-Paris in an *overcorrected* position, *viz.*, the bowlegs are made knock-knees and vice versa. Now it is clear from Wolff's law why this is necessary. Why should not the laterally curved spine be *similarly treated in the early stages?*

Without further digression in regard to treatment I wish to bring to your attention some observations in regard to the etiology of this condition.

ETIOLOGY.

For the past two years Compton Riely of my clinic has been carrying on certain observations in measurements, which you will see has unfolded an entirely new aspect as to the etiology of scoliosis, or we may say a hitherto unrecognized but important factor in the production of this condition. Riely presented at our last meeting his observations on this subject and later published them in the *Journal of the American Medical Association.*

Hitherto practically all observers have viewed rotary lateral curvature of the spine as a condition due to changes in the spinal muscles.

Many of us can recall efforts to determine by dynamometers or by electrical stimuli differences in strength or reaction on the two sides of the back, with negative or contradictory results, so that the question is still mooted.

Some of us, notably Shaffer, have held that the so-called "intrinsic muscles" of the erector spinæ group are to blame and have even suggested the division of these bow strings on the concave side. Thus you will see that the much abused and accused back and spinal muscles have never been found definitely guilty to the satisfaction of all.

Our attention was drawn into another direction by measurements made, as I have said, by Compton Riely upon the pelvis of these cases and the observation that the crest of the ilium in a large proportion of these cases was higher from the floor in standing, or from the chair in sitting, on the side of the dorsal convexity, and that the whole ilium on that side was more vertical and less flared than its mate. In other words, in right dorsal scoliosis the right side would represent the male type of pelvis and the left the female type. In left dorsal scoliosis of course the reverse was noted. This is especially noticeable in plaster models of the trunk preparatory to correcting them for corrected jackets.

It is well known that the Y cartilage, which unites the three elements of which the ossa innominata are composed, does not begin to ossify until the thirteenth or fourteenth year and this ossification is not complete until the twenty-fifth year, about the same time that the vertebras are also completely ossified. Thus changes in the normal relationship between the ilium, ischium and pubes from extraneous or developmental causes may readily occur before puberty.

Asymmetry in the pelvis has been completely noted in unilateral congenital hip dislocation and coxa vara, in which conditions abnormal muscular pull seemed responsible for the changed bony relations and shape. Wolff has taught us that not only the soft parts are susceptible to ready change in external contour and internal structure, but the bones as well have plasticity.

It would not require a very wide stretch of the imagination to recognize that marked changes can and do occur in the pelves of children in scoliosis from habitually faulty attitudes in sitting and standing through the agency of the abnormal muscular pull.

Of course it was not maintained by Riely, nor do I claim, that in all cases of scoliosis do we find a distorted and asymmetric pelvis, for it is a well recognized and conceded fact that short leg, flat-foot, thoracic, ankle, knee and hip disease may unbalance the vertical position of the spine.

Reasoning however from the elevated iliac crest which we have found in a large percentage of these cases, we must seek for a definite cause of the rotation as well as the lateral deviation of the spine. One naturally asks what is attached to the iliac crest and we find there the abdominal muscles. Can they affect the spine?

Suppose we wish to produce rotation in a very heavy vertical machine, such as a capstan on board ship for weighing anchor, we do not insert short bars to effect rotation, but avail ourselves of the long capstan-bar to gain greater leverage (Fig. 1).

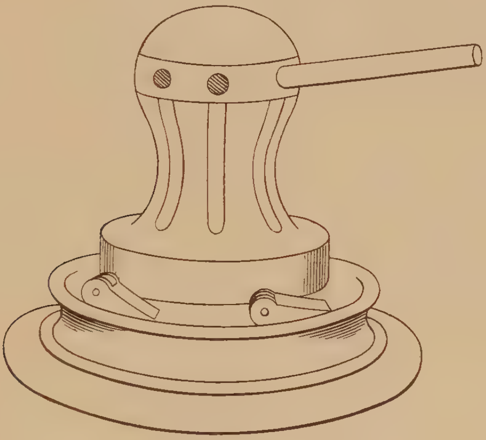

Fig. 1.

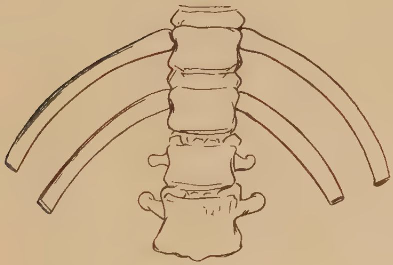

Fig. 2.

So in the spine it is unreasonable to endeavor to prove that the comparatively short, adjacent, deep spinal muscles effect rotation acting upon the short transverse and spinous processes when we have those long levers of the ribs, which are practically continuations of the transverse processes (Fig. 2). The superficial spinal muscles attached to the ribs have chiefly to do with the movements of the shoulders and arms and therefore cannot play a prominent part in causing scoliosis any more than the deep group attached to the spinous and transverse processes.

Further, let any one of us stand before a mirror and try to assume a position of right dorsal scoliosis and see for ourselves how this is most easily effected.

First, let us say, the weight is borne entirely on the right leg, a posture which is so habitually assumed by these cases and thereby the iliac crest is raised on that side and depressed on the other. Then by means of the contraction of the left external oblique abdominal muscle and the right internal oblique *the ribs on the left side are brought nearer the right anterior superior spine, are carried further forward by* the same pull and a lateral deviation and rotation are produced *pari passu.*

Now in right dorsal scoliotics, whether we say that the left external oblique and the right internal oblique through the aponeurosis act as one muscle, increased power being obtained by the abnormal proximity of the left ribs to the right iliac crest, or that the abdominal muscles of the right side are relaxed and those of the left are put on stretch (Riely), from a mechanical standpoint the asymmetrical action of the abdominal muscles, especially the external oblique through its ample attachment to the ribs acting upon the spine, has much to commend it in working out a theory of the causation of scoliosis.

Whether the changes in the pelvis occur before the perverted abdominal muscular action distorts the spine, or whether they both occur at the same time with progressively more marked resulting changes in both, it is hard to say.

From this we would gather that the primary curve was dorsal with rotation and as the pelvis as a whole becomes tilted the lumbar curvature to the opposite side was produced as a compensation to the dorsal curvature or as the result of the resistive tension of the adjacent structures, or produced by both causes.

Although these may not be, and probably are not, the only factors in the production of scoliosis, they are suggestive.

TREATMENT.

In conclusion I wish briefly to mention a few original methods I have been using in working along these lines and will consider the question of treatment under three headings, *viz.*, Preventive Treatment, the Treatment of Flexible Curvatures, and Partially Flexible Curvatures.

As before stated, if a girl exercises for an hour a day and her spine is allowed in the remaining twenty-three waking and sleeping hours to remain in a distorted position, the functional pathogenesis of deformity will undoubtedly "get in its work," if I may be permitted to use the language of the day.

PREVENTIVE TREATMENT.

As faulty attitude plays such an important part in the development of scoliosis by destroying the equilibrium of the pelvis and throwing a constant overstretch and strain on one set of muscles, thereby weakening it, while its fellow on the opposite side of the body is unduly relaxed or acts unopposed, attention to the positions, habits of attitudes, and the like, in growing children seems of the first importance, more especially where they are delicate or rapidly developing.

Thus in the case in point we have noted that children with right dorsal scoliosis almost invariably stand on the right leg, with left thrown out and not bearing the body weight; this lowers the pelvis on the left side, raises it on the right and brings the ribs of the left side abnormally near the anterior superior spine of the right side. Thus the left external oblique and right internal oblique may retain their power while their mates are overstretched and strained. At the same time the outward rotators and extensors of the left thigh are flaring what we term the plastic left ilium, while the abdominal muscles are making the right ilium abnormally vertical.

These same children lean on the right elbow, with the left leg stretched away out laterally, and the same results occur to the pelvis and abdominal muscles in sitting as in standing.

Incidentally I might mention violin playing as especially detrimental to children with a predisposition to right dorsal scoliosis, as I have repeatedly observed it. The violin masters, I understand, require their pupils to be able to see their left elbows under the body of the violin, thus throwing the dorsal and lumbar spine to the right of the median line and the left anterior costal margin nearer the right iliac crest.

The Treatment of Flexible Curvatures.

By "flexible curvature" I mean a real curvature and not the so-called postural affair, which is produced only on assuming certain positions, but the curvature which is always present, but still flexible, and the vertebral bodies have not assumed a wedge shape as shown by the X-ray.

For such cases routine gymnastics should be employed and *in addition a group of exercises prescribed to stretch the left to right abdominal muscles* of right dorsal convexity and relax those of the concavity. For example in right dorsal scoliosis we may use

(1) Hoffa's self-corrective, exercise with the right knee flexed.

(2) Key-note, or best corrective position, left fall-out standing.

(3) Rest, left spring-sitting.

(4) Right run-hanging, twisting to left, etc., etc., as types to accomplish this.

If we find the crest of the ilium low on the side of the concavity, we should raise the sole of the shoe on that foot, just as we would do for a short leg which makes the brim of the pelvis tilt down similarly. In a large proportion of these cases I have devised and used with advantage a brace made of webbing to overcorrect the deformity. A padded belt is made to buckle on with perineal straps. A ring of webbing should surround the right shoulder in right dorsal scoliosis (see Figs. 3 and 4) and have straps so arranged as to pass over the rotated ribs in the back on the right side, and in front on the left side over the rotated ribs to buckle near the crest of the left ilium. This reverses the right lateral lean of the trunk to left lateral lean. In order to keep the shoulder strap in place and to exert better leverage on the laterally leaning spine, a strap is passed from a buckle or pulley on the summit posteriorly of the shoulder around the cervical region, which often shows a secondary compensatory curve, around to a corresponding point on the shoulder strap in front, where it buckles or passes over a pulley by means of an attached cord to the lower webbing strap. On the posteriorly rotated ribs a strip of surgeon's plaster is stuck, passing downward, outward and forward obliquely to terminate in a piece of webbing which also buckles on the left side of the pelvic belt. This adhesive plaster intwists the rotation and brings the anterior costal margin nearer the left anterior superior spine. In several cases a second derotating piece of adhesive plaster with webbing may be carried from the left anterior rotated ribs downward, outward and backward to right side of the pelvic belt posteriorly. Experiments will determine at what points to attach the buckles in order to obtain the greatest amount of correction possible.

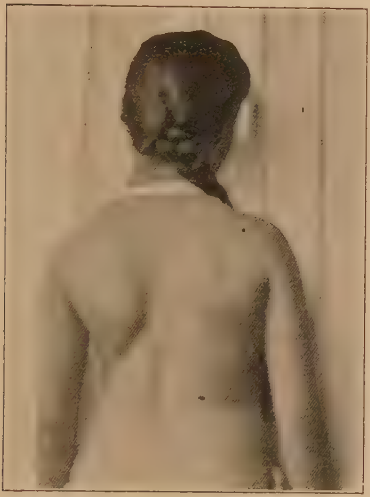

FIG. 3.

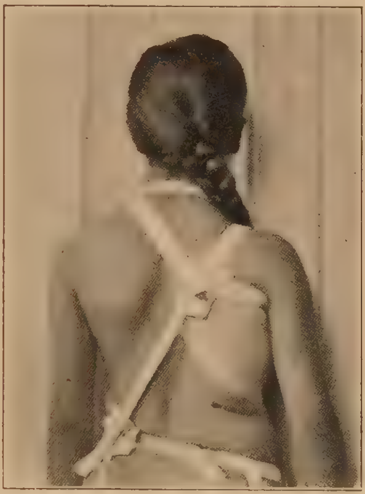

FIG. 4.

With this device much can be accomplished, and it is of great value in older children as well as in very young cases, who are too small to do gymnastic exercises with any degree of skill or benefit.

To my mind flexible cases should wear this device at all hours when not doing gymnastics.

PARTIALLY FLEXIBLE CURVATURES.

In those cases where the foregoing methods of treatment are of no avail recourse must be had to very active forcible gymnastics in side bendings in prone standing; active forcible machine correction, such as the Lorenz roller or pad, Zander and Schulthess' rockers, the passive Hoffa twister, the large Taylor recumbent kyphotone and Riely's scoliotone.

The pelvic belt and perineal straps and adhesive plaster arrangement can be worn by these more advanced cases with benefit, but usually the shoulder strap is not sufficiently effective and only the adhesive derotating straps and pelvic belt are used.

Our rule is to make laced jackets of plaster-of-Paris or celluloid *overcorrected* casts for these last-named cases in addition, and for the fixed cases solid jackets put on in the Hoffa machine to aim at *overcorrection*.

The principle of the webbing, cord and adhesive plaster brace described can be likened to a flexible bent steel rod supported on a rigid stand.

DISCUSSION.

Dr. H. AUGUSTUS WILSON called attention to some recent investigations by Gould in eye strain as a cause of scoliosis. He had examined quite a large number of these cases and in almost every case had been able to confirm the investigations and findings of Gould, that certain angles of astigmatism produce certain angles of the head, producing definite alterations in the muscles and the spinal column. A more elaborate discussion of the matter will appear later.

Dr. R. W. LOVETT, of Boston, said with reference to the alleged predominance of scoliosis in girls, recent investigations show that if anything it is more common in boys. In an investigation among several thousand school children it was found to be pretty nearly equal in both. At the clinic of the Children's Hospital, out of 35 total curves 34 were right and one left. As far as his own experience goes the condition is very apt to be a total curve early and a compound curve later. The abdominal muscles may be a cause of curves, but the spine by its own mechanism can get into such curves. He agreed with Dr. Taylor as to the desirability of bringing about a bony balance. There are two separate lines of treatment which should not be confused in our minds. Treatment is to give flexibility and treatment is also to give correction. For the production of flexibility, direct side pressure with the patient in the prone position is the best. With the spine slack and straight, the patient lies down and as much pressure as he can stand is applied sidewise to the lateral curve. Gymnastic exercises are intended more for the corrective element of the treatment.

Dr. Compton Riely, speaking of the causes of scoliosis, said that the ribs act as levers through the force of the abdominal muscles. As far as his observation goes, most of the cases occur in girls. In the male the innominate bonés are more vertical, while in the female they are more slanting. In sitting in the flexed position we rest on the sacrum. Girls sit more than boys.

X.

THE TREATMENT OF CLUB-FOOT: ARE THE MORE EXTENSIVE CUTTING OPERATIONS NECESSARY?

B. E. M'KENZIE, B.A., M.D., TORONTO.

Having notes of four hundred cases of congenital talipes equino-varus of ages varying between infancy and forty-six years of age, who have come under my care since 1888, and having in the earlier years adopted the more radical methods, and as a large proportion of the patients treated have been adults, there has grown up with me as the years, have passed, the conviction that better results are obtainable by laying more stress upon manipulative methods and exerting a large amount of force in manipulation even in adults than can be secured by the more extensive cutting operations.

The majority of the extensive operative procedures that have been employed have been well summarized by Lorenz, and quoted by Keetley as follows:

A. Osteotomies.

1. Linear division with the chisel, of the scaphoid from the sole (Hahn).
2. Linear osteotomy of the tibia above the ankle-joint (Hahn).

B. Enucleations.

(*a*) Of a Single Bone.

3. Of the cuboid (Little, Solly).
4. Of the astragalus (Lund, Erksine, Mason), with three modifications.
5. Of the astragalus, with excision of the point of the external malleolus (Erksine, Mason Reid).
6. Erasion of the spongy substance of the astragalus, leaving its articular surfaces (Verebely).

Presented at the Eighteenth Annual Meeting of the Association, Atlantic City, N. J., June 8-10, 1904.

7. Enucleation of the astragalus and excision of a perpendicular wedge (with its base external) from the whole thickness of the anterior process of the os calcis (Hahn).

(*b*) ENUCLEATION OF THE SEVERAL BONES.

8. Of the astragalus and cuboid (Albert, Hahn).
9. Of the astragalus, cuboid and scaphoid (West).
10. Of the scaphoid and cuboid (Bennet).

C. RESECTIONS.

11. Of the head of the astragalus (Lücke, Albert).
12. Of a wedge from the outer half of the neck of the astragalus (Hüter).
13. Of two wedges, at right angles to each other, one from the median tarsal, the other from the astragalo-calcaneal joint, both having their bases external (Rydygier).
14. Of a wedge from the tarsus regarded as a whole, and not from any special bone or joint belonging to it (O. Weber, Davies Colley, R. Davey).

Keetley further adds that Verneuil has removed not only the astragalus, but the scaphoid, cuboid and anterior part of the os calcis. There probably have been other operations for the removal of the bones of the foot. Osteotomy on the leg bones has been done occasionally for relief of the deformity.

Seeing that most of these operations are of serious import and that death has occasionally resulted, and that extensive sloughing of the parts has also followed these procedures, the burden and responsibility of proof in the adoption of such measures for the correction of the deformity must, in justice, fall upon those who recommend such radical operative intervention. In 160 recorded tarsectomies collected by Lorenz there were four deaths. In 400 cases here referred to there was no death and no amputation.

The limb and foot affected are imperfect in their growth and development as a consequence of the pathological conditions present. Whatever method of treatment be adopted the affected foot will be found shorter and smaller than its normal mate; consequently, operative measures which tend to shorten the foot are contraindicated. It is true that a foot may not be shorter because of the removal of the astragalus, but the leg is made shorter thereby, and even without such an operation the limb is sure to be found somewhat shorter than its fellow, a condition which is accentuated and aggravated by the removal of the astragalus. Not only are the foot and leg made shorter by such operations, but the future growth is rendered less and development is impeded if done during the growing period so that there will result an increasing disparity between the limbs. These objections may fairly be urged against any operative procedure proposing the removal of any bone or bones, or portion of bone, from the convex prominence of the deformed foot.

The open incision, so strongly recommended by Phelps, is free from some of the objections just enumerated, and in the adult is a more justifiable operation than those which depend upon the removal of bone. The experience of the writer, however, in correcting the most obstinate cases of club-foot even in the adult, would seem to indicate that such a procedure as that of making a free open incision of the soft parts is not necessary, and that no satisfactory reason can be given justifying its performance. When done in children whose growth is still in progress it interferes materially with the development of the foot. Fig. 1, here shown, is a cut giving the result in a boy of ten, at the time of treatment, having double club-foot of a severe type, one of whose feet I corrected by the Phelps method and the other by persistent, continued manipulation, the treatment of the two feet being carried on at the same time. The time occupied by the treatment in the latter, if it be measured by the period which elapsed between the commencement of treatment and the patient's ability to walk freely, was less than in that which was treated by open incision. At twenty-one years of age the photograph was taken from which

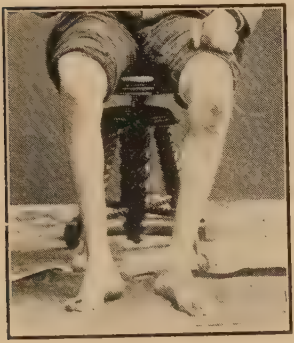

Fig. 1.

the foregoing cut is obtained. The young man tells me that the foot which was operated upon by the cutting method (the right foot) is much less efficient than its fellow and its form is not so good.

Free incision of the nerves and vessels which was recommended by Phelps, along with the other soft parts, could not fail to have a retarding and hurtful influence upon the growth and development of the foot. The younger the child in whom such an operation is performed, the greater will be the detriment to the limb in the effort to secure an ideal result.

In one of my early cases, a man about twenty years of age in whom I made free open incision, I got a satisfactory result in one foot; in the other, however, sloughing of the anterior lip of the wound occurred and I found it impossible afterward to prevent contraction and consequently a much shortened and deformed foot.

In a number of cases that presented themselves some years after operation by open incision had been done, I found a considerable degree of relapse resulting from contraction at the place of incision. In such cases I found it impossible to obtain a final result as good as could have been obtained if the patient had never been treated previously. In a number of others the arch had given way unduly and a condition of flat-foot resulted.

In order to make a fair comparison of the results from the various extensive cutting operations with those obtained by manipulative operations, it is important to review briefly the pathological anatomy of club-foot. All the structures participate in the deformity; from bone to skin there is no structure which is not altered. Nearly all of the individual bones are somewhat changed in shape, those most noticeably affected being the astragalus, os calcis and the scaphoid, but the cuneiform bones also participate to a large degree. In addition to this their position and relations to each other are altogether abnormal, the anterior ones being slid around those that are behind them so as to articulate much more toward the inner aspect. The scaphoid bone is sometimes carried so far toward the inner side as to form an articular surface with the inner malleolus. The muscles, ligaments, fascia, vessels, nerves and skin toward the inner border of the foot and of the plantar surface are relatively shortened.

If the deformity were definitely limited to some one part of the foot as for example, to the mid-tarsal joint, as the deformity is limited definitely to one place when the fragments of bone resulting from fracture are so misplaced as to result in angular deformity, then some definite cutting operation at that point which would correct the deformity might be justified mechanically. Seeing, however, that all parts of the foot are deformed, any process which will distribute the rectification over a larger area of the foot is indicated rather than a procedure which centralizes and limits itself to one definite place.

There are four elements which enter into the deformity of a typical case of congenital talipes equino-varus:

(1) Varus.
(2) Supination.
(3) Cavus.
(4) Equinus.

The term *varus* should be limited to signify the inward bending of the foot *per se* in such a manner as to give a concavity toward the inner border and to the horizontal axis of the foot, passing lengthwise through the center of the os calcis and continued to the middle toe. (The term *valgus* should then be employed and be limited to signify the exact counterpart of the word *varus*.) A foot in which the horizontal axis forms a straight line may be regarded as normal although some latitude must be allowed in this matter.

The term *supination* is here used in the ordinary sense implying depression of the outer and relative elevation of the inner border.

It would be well to limit the word *cavus*, or the word *arcuatus* to signify an unduly arched condition of the foot. Here again considerable latitude must be allowed in determining what degree of concavity is normal.

It would be well to limit the word *equinus* to indicate the relation of the longitudinal axis of the os calcis to that of the leg. The exact angle which these two axes may form with each other in dorsiflexion will vary in different individuals; but if it be regarded as 75° in front, then a foot which does not permit the anterior part to be elevated sufficiently to form the required angle should be considered as being in a condition of equinus.*

In the deformity of a typical case of club-foot the foot is (1) in a condition of varus, that is to say, the axis of the foot which would pass through the center of the os calcis from one end of the bone to the other and be continued forward through the center line of the foot is curved so as to present a greater or less degree of concavity toward the inner border. It will also present a concavity downward toward the plantar surface. (2) The foot is also rotated about the axis above described so that the inner border is tilted toward the dorsum while the outer border is depressed in the direction of the plantar surface. This rotation occurs partly at the junction between the os calcis and the astragalus, and partly at the joining of the astragalus with the leg. (3) The foot in its relation to the leg is turned about a transverse axis passing through the astragalus so that the anterior part of the foot is depressed and the heel elevated—a condition of equinus.

In adopting means of treatment the above facts concerning pathological anatomy must be borne in mind and must constitute definite governing principles of action.

The condition of equinus is accompanied by shortening of the tendo-Achillis. The direction so frequently given for treatment that the first step should be to cut the tendo-Achillis, bring down the posterior part of the os calcis and elevate the anterior part of the foot, is at variance with the best mechanical principles to be adopted in correcting the entire deformity. In a patient whose foot is found before any operative or manipulative intervention has occurred, the long axis of the foot is largely a continuation of the axis which would pass directly through the length of the leg but is concave toward the internal border of the foot. Any force applied tending to correct the varus under these conditions would have the outer convex border of the foot as a fulcrum; the axis extending toward the leg would become a lever; and force applied for straightening this axis could be applied with great mechanical advantage. If the tendo-Achillis be cut, the posterior part of the os calcis brought down and the anterior part of the foot be brought to a position of right angles with that of the leg, then any effort made to straighten the varus may fairly be compared to the force pulling upon a crank (the longitudinal axis passing through the foot), while the axis about which the crank turns (or rather the axis which is turned by the crank) is represented by the axis of the leg.

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* The above seems to be the only logical definition which can be given. The term, however, has been employed generally to signify a condition in which the long axis of the foot makes an obtuse angle with the leg in front.

In my experience the greatest difficulty encountered in making complete correction of the deformity of club-foot has been in completely overcoming the element of varus above described. It is the exception to encounter any serious difficulty in correcting the element of equinus. If the first step taken, however, be to convert the foot into a crank by cutting the tendo-Achillis and bringing the heel down while the leg is the axis to which the crank is attached, it becomes impossible to exert any considerable force in straightening the curve in the crank (the varus element); whereas, if the tendo-Achillis remain intact there is a great mechanical advantage in applying the force designed to obliterate the varus.

The difficulties encountered in obtaining an ideal foot are not increased in proportion to the age of the patient; the obstacles to be overcome in securing such an ideal result depend more upon the form and condition of the foot. The difficulties are increased in proportion as the foot is shorter and stouter; and because of this fact efforts made for correction meet with more encouragement after the child has passed its first or even its second year.

It is my usual custom when consulted regarding a young infant to advise that no treatment by the surgeon be adopted until the child has entered its second year. During the first year the nurse or the mother should manipulate the foot, especially so as to correct the varus; but all bandages and braces should be shunned. It is the universal observation that a foot thus deformed is not so well developed as its fellow which is normal in shape. Accordingly, if the foot and leg are bandaged and constricted during the first year or two of life this disparity increases. Occasionally I have found the affected leg shorter than the other to the extent of one or even two inches in early adult life. There is no advantage in having the deformity fully corrected before the period of life when the child walks. The most natural and the most successful means of retaining the foot in a normal position, preventing relapse, is found in the natural walking of the child. Generally speaking, this does not occur till the early months of the second year; hence, all the advantages are in favor of leaving the foot entirely free from constriction and in employing massage and corrective manipulation from birth up till this period so as to encourage the development of a member which is naturally below par.

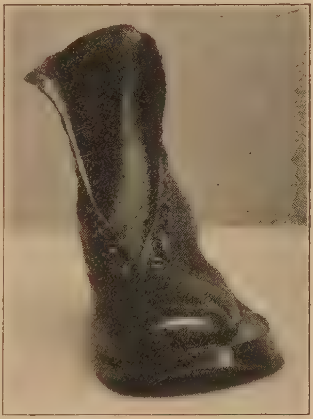

FIG. 2.

Assuming that the methods of manipulation are carried out intelligently by the nurse during the first year, the surgeon is then called upon to intervene in time to correct the deformity so that the child when he first walks will employ a foot which is held in its normal position.

The after-treatment is simple but should be thorough. Assuming that the correction of the deformity has been thoroughly completed, that the foot can with the hand of the surgeon be carried into a position of valgus, pronation, and dorsiflexion of 75°, a club-foot boot such as that shown in Fig. 2 should be worn in the day time to the exclusion of every other boot. No day brace is required other than the boot named. At night a very simple brace (shown in Fig. 3) should be constantly employed retaining the foot at an angle of 75° with the leg and holding the foot slightly in pronation. The club-foot boot here referred to is the same that I have employed since 1889, and that Dr. Galloway described in Vol. XI of the Transactions.

The steps of treatment which I believe to be ideal are:

(1) To carry the distal portion of the foot strongly toward the outer border making the more prominent convex portion of the foot the fulcrum and securing the foot by a fixed dressing, preferably plaster-of-Paris, for a number of weeks without the removal of the dressing. In doing this it is commonly found that some or all of the following structures are definitely opposed to the replacement, namely:

(*a*) The plantar fascia and ligaments.

(*b*) The inner group of muscles.

(*c*) The anterior portion of the deltoid ligament.

These may be cut subcutaneously; the plantar fascia being accessible, it may be incised by introducing the tenotome behind the plantar arteries without causing much hemorrhage. At the same time the tenotome may be carried further so as to cut the plantar ligaments without encountering important vessels or nerves. It will seldom be found practicable to make a full correction of the varus at the first dressing; further cutting, however, is seldom necessary and dressings may be repeated until the varus has been overcorrected.

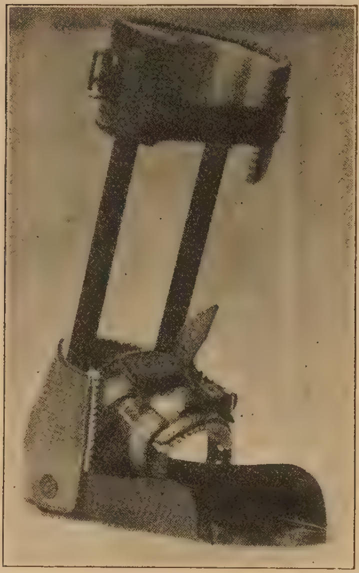

Fig. 3.

(2) Assuming that this element of the deformity has been

fully overcome, the tendo-Achillis may be cut and the anterior part of the foot raised into position. In accomplishing this purpose the broader, anterior part of the articular surface of the astragalus may be found too wide to permit of being carried readily into position between the malleoli. If a few weeks be allowed to elapse, however, after the foot has been pushed forcibly toward the desired position it will then be found capable of being carried much more completely into the desired relation to the leg.

The plans and principles of treatment do not vary from the above whatever be the age of the patient. In dealing with an adult there are marked advantages as well as disadvantages. Measuring forward from the fulcrum represented by the prominent boss on the outer part of the foot the lever arm in the adult is much longer than in the child, and a great amount of force may be employed, section of the structures subcutaneously being effected as above de-

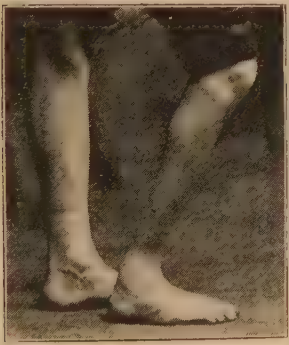

FIG. 4.

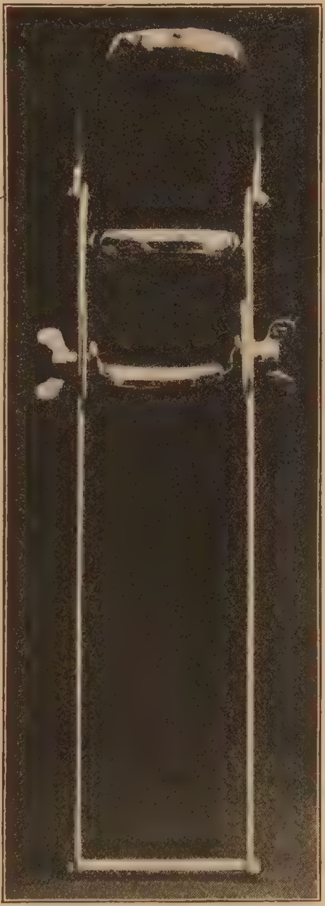

FIG. 5.

scribed, retention being also made in the same manner. Dressings are repeated from time to time till the varus be fully overcome. In the correction of the equinus there is increased difficulty in the adult as compared with the same part of the operation in the child in bringing the anterior part of the foot upward so as to place the plantar surface at an angle of 75° or 80° with the axis of the leg (Fig. 4, a man twenty-seven years of age after correction). It is seldom necessary, however, even here to adopt any radical operative measure. Osteotomy of the fibula may be done permitting separation of the malleoli.

Various club-foot wrenches have been employed. That which is shown in Figs. 5 and 6 is one that I have brought to its present form by a succession of modifications, as they seemed called for, to meet the indications.

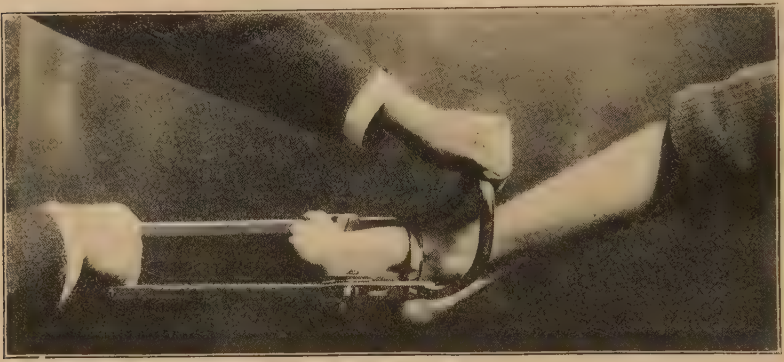

FIG. 6.

It consists of two parallel levers twelve inches in length having two curved crossbars between, the concave surface of one crossbar passing over the dorsum and the corresponding surface of the other passing under the metatarsal bones. These move on pivots so as to adjust themselves easily to the foot; the one under the metatarsus is held in position by thumb nuts by which it can be moved nearer to or farther from the one which crosses the dorsum so as to meet the requirements of feet of different sizes. The levers at the foot end are carried one and one-quarter inches beyond the dorsal crossbar and are there joined by a movable handle convex toward the foot which may be grasped by the operator's hand to aid in manipulation.

The concave form of the crossbars gives the wrench a secure grasp of the foot when the operator's hand lifts the distal end thus enabling him not only to exert a lifting force, but to twist strongly at the same time, employing the handle at the foot end of the wrench to aid in the twisting. The side plates, which move with the crossbar, guard the side of the foot enabling the surgeon to make strong lateral pressure.

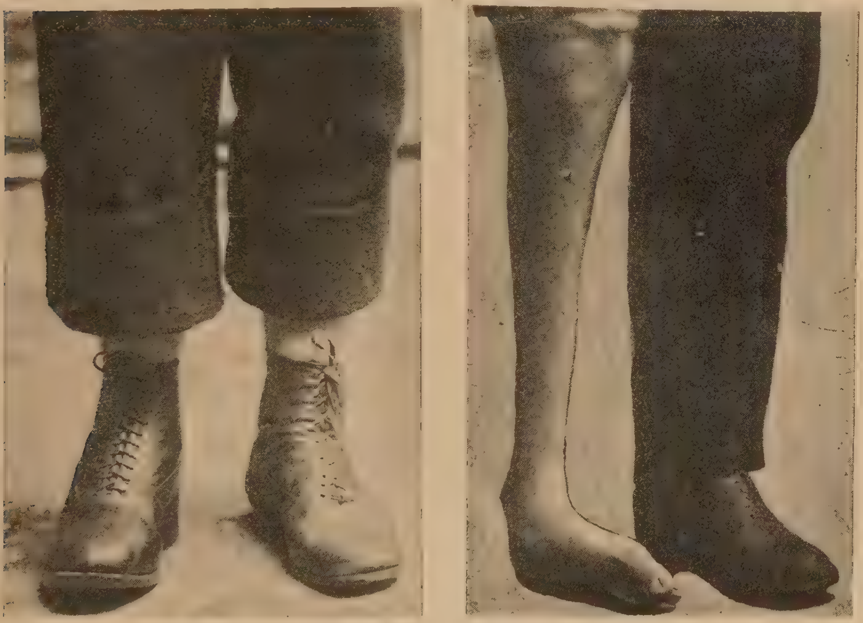

FIG. 7.

Complete correction of the deformity may be obtained in nearly every instance, if not in every instance, of congenital club-foot at any age by the simple means above described.

Operations for the removal of bone I have not done during the last seven years. Neither have I in the last ten years made free open incision of the concave border of the foot. During this period of time three hundred cases have been corrected and the ordinary results are such as those shown in the photographs presented. In the cases treated no selection has been made, no case has been excluded. (Fig. 7, a man nineteen years of age. Fig. 8, a man at twenty-seven years. Fig. 9, a man at thirty-one years. Fig. 10, a boy coming for treatment at four years of age.)

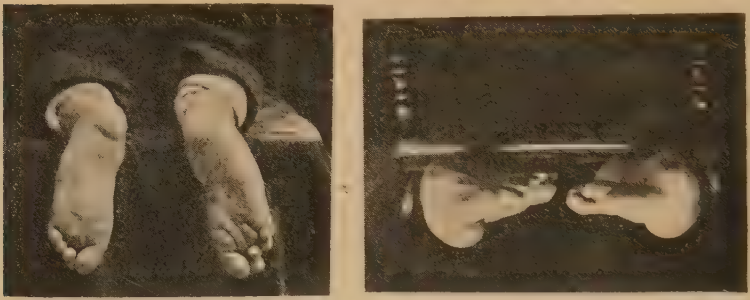

FIG. 8.

Basing my observation upon the cases here set forth I believe the removal of bone to be an operation seldom or never called for. I am further of the opinion that even in dealing with adults in less than 5 per cent. of all the cases is it necessary to make the open incision which was so ably advocated by the late Dr. A. M. Phelps.

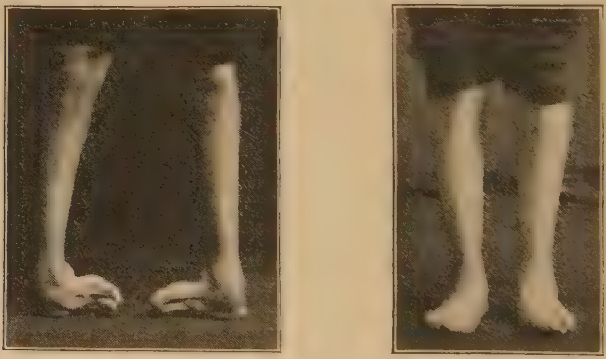

FIG. 9.

Forty-eight of the cases have been over ten years of age, thirty-one of the cases being over twenty years of age, and fourteen over thirty years of age. The results obtained justify the assertion that perfection of form can be obtained without osteotomy, without the removal of any bone, and without making an open incision at the inner border of the foot. If such results can be obtained in those who vary from ten to forty-six years of age they certainly can be obtained in those under ten years of age.

On an average, four months is ample time to allow for the active treatment of a case of club-foot. I have had a strongly marked case of double club-foot in a man of twenty-four years of age who left the hospital walking without any form of support in three months from the day that he entered. Many other adults at about thirty years of age had the deformity cured and function restored so as to permit walking without support within four months from the time treatment was commenced. In some of the cases restoration to usefulness could have been secured in a shorter time had they not chosen to have the treatment continued somewhat more slowly. Much must depend upon the individual who makes the reckoning as to the time required. It can scarcely be considered fair to reckon that a patient has recovered when healing of the opera-

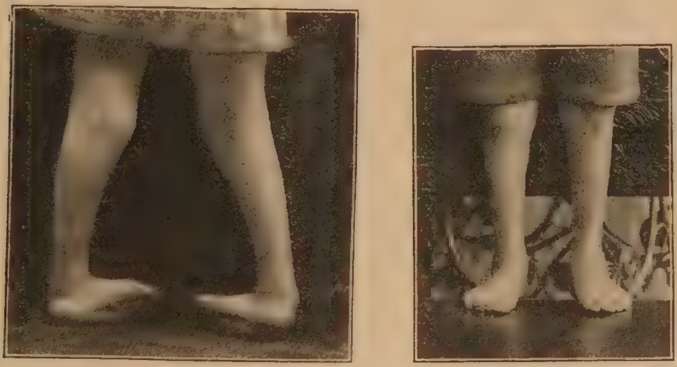

Fig. 10.

tion wounds has resulted. Much tenderness and disability remain for a long time after any of the extensive operations referred to; whereas, the time required to elapse in the case of operation by manipulative methods from the commencement of treatment until the patient is able to walk unaided by a brace, need not be more than three months.

SUMMARY.

1. The ideal time for active treatment by the surgeon is early in the second year.
2. Deformity of the foot *per se* should be fully corrected; afterward the relation of the foot to the leg.
3. Cutting other than that of a subcutaneous section of the ligaments, tendons and fascia is seldom or never required. Manipulative replacement and retention by fixed dressings sufficient.
4. After-treatment.—A retentive night brace and a properly constructed leather day boot.
5. Removal of bone contraindicated and harmful.
6. Open incision in young persons interferes with normal development of foot.
7. In persons under fifteen years of age congenital club-foot may be so perfectly cured as to give practically perfection of form and function.
8. In adults perfection of form may be secured. Function is somewhat impaired.
9. The time required for active surgical treatment need not be more than three months.
10. Age is no serious bar to treatment.

ABSTRACTS.

SPINE.

320. Spondylitis Deformans and Ankylosing Spondylitis. By Simmonds. *Fortschritte auf d. Gebiet der Röntgenstrahlen*, Band VII, Heft 2.

Simmonds separates the processes sharply from one another. He bases his deductions on over 300 cases of "spondylitis deformans" in which he finds a deformity of the bodies of the vertebras down to the first microscopic structures.—*Walter G. Stern, Cleveland.*

321. Chronic Ankylotic Stiffening of the Spine. By Frankel. *Fortschritte auf d. Gebiet der Röntgenstrahlen*, Bd. VII, Heft 2; review *Arch. f. Orthopaedie*, Band II, Heft 3.

From his examination of four cases, Frankel concludes that the separation of chronic ankylosing spondylosis into Bechterew and Strumpell-Marie types has neither a pathological nor a clinical basis and is not justifiable. He lays most weight upon trauma as the great etiological factor although in some cases the cause is unknown. The process is a chronic ankylosing inflammation which begins in the articular processes of the vertebras and destroys them: the laminas, bodies, and spines are affected secondarily, the articulations between vertebras and ribs are also attacked by this process. In contradistinction to spondylitis deformans the bodies of the vertebras are never deformed.—*Walter G. Stern, Cleveland.*

322. Spondylitis Typhosa. By Arapow. Abstr. in *Centr. f. Chir.* No. 17, 1904; from *Russian Archiv f. Chir.*, 1903.

Reports 2 cases of this disease both of which occurred about a month after the onset of typhoid. Both had positive Widal reaction and in both the lumbar segment was the seat. In one there was a transitory vesical paralysis. The case was well in one month. The other was discharged in three and one-half months.—*Albert H. Freiberg, Cincinnati.*

323. Infectious Spondylitis. By Quinke. *Mittheilüng. aus den Grenzgebieten*, Bd. XI; review *Arch. f. Orthopaedie*, Band II, Heft 3.

Quinke describes 3 cases, one after a typical pneumonia, the second after a pleurisy of streptococcic origin and the third as a sequence of typhoid fever. Spondylitis infectiosa can result after any infectious disease. The involvement of the marrow of the vertebras is analogous to the enlargement of the spleen in infectious diseases.—*Walter G. Stern, Cleveland.*

324. Acute and Chronic Recurrent Spondylitis after Influenza. By Milner. *Mittheilüngen aus den Grenzgebieten*, Bd. XI; review *Arch. f. Orthopaedie*, Band II, Heft 3.

Milner states that Perez found the influenza bacillus in "bone marrow and in the various inflammatory changes of all the bony constituents." He reports a case of spondylitis of the lower three dorsal vertebras four weeks after an influenza pneumonia with partial paralysis of the lower extremities. There was no distinct kyphos but rather marked thickening about the spinous processes.—*Walter G. Stern, Cleveland.*

325. Curvature of the Spine in Syringomyelia. By Borchard. *Mittheilüngen aus der Grenzgebieten der Med. u. Chir.*, Band XII; review *Arch. f. Orthopaedie*, Band II, Heft 3.

In 18 cases of syringomyelia, 17 showed more or less deviation of the vertebras, and 13 cases towards the side that showed the most pronounced nerve, bone and joint lesions. The localization is not constant but Borchard believes the scoliosis of syringomyelia to be more generally located in the lower cervical and upper dorsal regions. The pains are due more to pachymeningitis than to any actual changes in the bodies of the vertebras. Borchard has not observed in any of his cases the "thorax en bateau" described by Marie and Astié.—*Walter G. Stern, Cleveland.*

HIP.

326. An Apparatus for the Rational Application of Plaster in Hip Disease. By Silberstein. *Archiv f. Orthopaedie*, Band II, Heft 3.

The apparatus consists of a tapered board, which can be fastened to a table, on which the patient is laid. There is also a stand for applying extension and a board for measuring the degree of deformity. The member is then encased in plaster-of-Paris which reaches from the toes to the nipples. Silberstein claims for his method:

(1) Solid fixation of pelvis and ability to partially correct deformity without narcosis.

(2) Ease in applying cast and comfort for patient.

(3) Ability to model cast so that it fits perfectly.

(4) Apparatus is compact and easy to transport.—*Walter G. Stern, Cleveland.*

327. Advantages of Early Operation in Hip Joint Disease. By E. C. Taylor, Jackson, Mich. *Jour. Mich. State Med. Soc.*, vol. iii, No. 9, Sept., 1904.

After referring to the pathology, predisposing causes, symptoms, and general treatment of hip disease, the author advocates drainage by operation in suppurating cases in which the natural sinuses do not allow free drainage, and early operative removal of necrotic bone and other tissue "after . . . a flow of pus has continued for a reasonable time without indication of improvement. I am convinced that we need not expect a cure in these cases, no matter what the treatment, unless a free removal of the diseased tissue is accomplished, and almost invariably a complete excision is necessary to insure that result. If there is a doubt I should always excise the joint."

There is detailed a case of extensively suppurating hip disease of four years' duration, treated by splint and extension, in which operation, however, had been put off. The patient, a girl of twelve, was of nearly normal height, but at this time weighed only twenty-four pounds. As a last resort, an operation was decided upon, and the upper third of the femur was excised. Fifteen months later, the girl had gained eighty-eight pounds.—*William E. Blodgett, Detroit.*

328. Treatment of Congenital Luxation of the Hip. By Narath. Review *Arch. f. Orthopaedie*, Band II, Heft 3.

Heredity plays an important rôle in the development of this deformity; in the report of 109 observations in 100 cases, at least 40 showed similar cases to have been present among the blood relations. Although trauma during the act of delivery cannot be the cause, in two other cases traumatic dislocations during labor resembled congenital hip dislocation in every particular.

The youngest child operated on was eleven months, the oldest not quite fourteen years. The crepitus and click of reposition are not constant and were missed in one-third of the cases, yet ideal cures were obtained from among this number. Narath combats the idea of "functional burdening" stating that it causes atrophy of the upper rim of the acetabulum and that the failures reported by Lorenz, Hoffa, Schede, Kümmell and others are due to the use of this method. Schede's osteotomy has not yet proven its value. The first cast, which does not include the knee and holds the femur in outward rotation, is left on for three months; for the next five months a new cast is applied every six or eight weeks, always improving the position. Exercise and massage complete the cure. Braces and instruments are never used.

Narath's results are quite different from those of other operators, 85.41 per cent. of bilateral cases and 56.06 per cent. of unilateral cases were "repositio completa" (which the reviewer understands from the text which follows to be synonymous with "anatomic cures"), and yielded by far the best functional results.

In all he has obtained:

Ideal function in	36.73	per cent.	61.21 per cent.
Very good function in	24.48	"	
Good function in	36.65	"	
Medium results in	4.08	"	
Bad results in	2.04	"	

Untoward results were: Five fractures, six hernias and paralysis in four older patients extended with Lorenz screw.

"The work of Narath must undoubtedly be considered one of the best contributions to our knowledge of congenital dislocation of the hip . . . and brings . . . great encouragement for successful advancement."—*Walter G. Stern, Cleveland.*

329. **Report of the Orthopedic Staff of the Boston Children's Hospital on 144 Cases of Congenital Dislocation of the Hip.** *Boston Med. and Surg. Journal*, July 28, 1904.

After summarizing the progress of the treatment of this deformity in this country, and particularly in the Boston Children's Hospital, where a very large amount of work has been done, the orthopedic staff, Drs. Bradford, Lovett, Brackett, Thorndike, and Dane make a report upon 144 cases treated at the hospital by various methods. In summing up the results, the writers say:

"The results presented indicate a gratifying continued improvement in treatment from the period when all attempts were fruitless even among younger children. At present, even at an increased age, the percentage of cures is considerable.

"It appears to be safe to claim that for all cases, single and double, under ten years of age, either by manipulation, by the use of mechanical force, or by reduction by means of incision, a complete reduction is possible, and that relapse can be prevented in more than 60 per cent. of the cases. For this, however, careful attention should be paid to after-treatment with attention to the following details. It is believed by the writers that a higher percentage and at a higher age limit can be expected, if all methods including the operative in the more difficult cases, are employed. (1) That the position of the limb should be such that the development of a firm cotyloid ligament be favored. (2) That the position of the limb should be such that the capsule should not be unduly stretched in its forward portion. (3) That the position of the limb should be frequently inspected and X-ray examinations be made at frequent intervals.

"Double cases are found to present more than twice the difficulty of single ones, and may require repeated operations to secure equally good results on both sides. Although operations by incisions without and with curettage of the acetabulum in the complicated cases will be used, in all probability, more commonly than at present in the cases when the simpler methods have failed. The method by forcible manipulation is, in the opinion of the writers, the one to be employed in the usual cases."

Tables are appended, showing the cases operated upon during different periods, and the improvement in results from one period to another. Photographs and skiagrams of some of the cases are shown.

In an addendum a committee of unbiased surgeons selected by the Society for Medical Improvement report upon a series of 12 cases, shown before the Society, which had been operated upon within the previous eighteen months. The report shows 10 cases reduced, 9 transposed to a position anterior to the acetabulum, and 2 still dislocated.—*John L. Porter, Chicago.*

330. Contribution to the Therapy of Congenital Hip Luxation. By Weischer, *Centr. f. Chir.*, No. 15, 1904.

Has independently been successful in employing the procedure of Reiner for the bloodless replacement of the luxations of older children in several sittings. His patients were fifteen and ten years old respectively.

At each sitting the extension was repeated and each time he succeeded in increasing the abduction by 10–15°. However, even after the trochanter had been brought anterior to the anterior superior spine, it was not possible to accomplish the reduction. An elastic resistance would each time force the limb into adduction. The capsule was too short and unyielding to allow the head to pass over the rim of the acetabulum.

He was moved by these considerations to adduct the thigh and to flex it past the thorax over a cushioned wedge. Inward rotation of the thigh now permitted the head to appear under the skin of the groin. By rapidly carrying the limb in the right-angled position and into the axis of the pelvis, the head was now made to spring into the socket in the typical manner.

He is of the belief that this maneuver would have resulted in a replacement sooner had it occurred to him to try it.—*Albert H. Freiberg, Cincinnati.*

KNEE.

331. Resection for Knee Tuberculosis. By Blauel. *Tübingen Beitr. z. Klin. Chir.*, Bd. XLII, No. 1; abstr. from *Journ. Am. Med. Assoc.*, Oct. 22, 1904.

Blauel states that 343 out of the 400 patients operated on can be regarded as completely cured. In 17 a secondary operation was necessary. About 15 per cent. died later from general tuberculosis. The proportion of successful resections was 87.9 per cent., in striking contrast to the 45 per cent. reported in König's statistics as cured by conservative treatment of tuberculous knee affections (126 out of 288 cases). He urges that operative radical treatment should be accepted as the standard procedure for all severe cases in both children and adults, and also for the mild ones when good conservative treatment is not promptly beneficial or is impracticable for any reason.

332. Joint Diseases in the Röntgen Picture. By Immelmann. *Centr. f. Chir.*, No. 16, 1904.

In the differentiation of free bodies in the knee, calls attention to the sesamoid bone which, in 30 per cent. of the cases, is found in the lateral head of the gastrocnemius and which has been frequently mistaken for a free body.—*Albert H. Freiberg, Cincinnati.*

333. Contributions to the Pathology and Therapy of Knee Joint Diseases.

By Hoffa. *Berl. klin. Woch.*, No. 1, 1904; abstr. *Centr. f. Chir.*, No. 16, 1904.

Calls attention to a clinical picture which is not sufficiently well known and which is called forth by a reflex arthritic muscular atrophy which in turn is caused by an irritation of the joint nerves; it is consequent upon a trauma and may appear within a few days having a relaxation of the capsule as a result. Pain is caused by the pinching of the capsule. The symptoms can be made to disappear within six weeks by massage and gymnastics and especially by means of well devised resisted movements.

Attention is also called to the symptoms caused by internal derangement as well as the hypertrophy of the fringes.—*Albert H. Freiberg, Cincinnati.*

334. The Influence of Adipose Tissue with Regard to the Pathology of the Knee Joint.

A. Hoffa, Berlin. *Jour. Am. Med. Assoc.*, vol. xliii, Sept. 17, No. 12, p. 795.

Hoffa draws a distinction between the lipoma arborescens of Johannes Müller which results from an exuberant growth of the fat villi and the lipoma solitarium of König which is a true tumor. The latter König believes to come from some trauma of synovial membrane effecting a slit through which the para- and retrosynovial adipose tissues escape into the joint.

Hoffa does not consider all these as real tumors but classes them as inflammatory fibrous hyperplasias.

He describes the normal knee joint with its plicæ and their histology. Very slight traumata apparently induce a "hyperplasia inflammatoria" and simulate true lipomata though with different histology from normal adipose tissue. The symptoms of sudden pain, frequent locking, absence as a rule of extravasation into the joint, usually unimpaired motion and slight crepitation, strongly suggest this condition and simulate a loose body.

Pain in separation of the meniscus is more sharply localized. Floating bodies may be determined by the Röntgen rays while the faint shadows in the skiagraphs in the otherwise clear space between the patella and femur and tibia suggest the condition under discussion. The treatment strongly advised after the conservative measures of protection massage, etc., have failed, is operation under the most scrupulous aseptic conditions. The results are often very brilliant. He leaves a small gauze drain for twenty-four hours, takes out the stitches in eight days and allows the patient to walk. The full use of the leg is usually gained in from six to eight weeks.—*Robert B. Osgood, Boston.*

335. A Case of Voluntary Dislocation of Both Knee Joints in a Girl of One Year.

By Aronheim. *Monatschr. f. Unfallheilkunde*, 1904, No. 2; review *Arch. f. Orthopaedie*, Band II, Heft 3.

No history of trauma; when the child is restless it can voluntarily dislocate and replace its knee joint five to six times per minute. Careful examination revealed nothing abnormal about the knee, nor could it either be dislocated or replaced by external force.—*Walter G. Stern, Cleveland.*

336. Dislocation of the Semilunar Cartilage of the Knee.

By Schlatter, Zurich, in *Beitr. z. klin. Chir.*, vol. xli, No. 2; abstr. from *Journ. Am. Med. Assoc.*, Aug. 13, 1904.

Schlatter adds 5 cases from Krönlein's clinic to those found in the literature, bringing to 62 the number of known instances of dislocation of the semilunar cartilage of the knee. All but 17 were dislocations of the internal meniscus. The luxation is always due to rupture of some kind, and it may be suspected when there is sudden pain, resistance developing in the cleft in the joint and swelling of the joint capsule. Contrary to von Bruns' experience, he found that the cartilage protruded more frequently during flexion while it disappeared in extension. The results were invariably fine in every case after operative intervention, although all had been long treated in vain by other measures. In some rare cases, however, some trivial disturbance in the function of the joint developed in the course of years, slight atrophy of the muscle or limitation of extension.

337. **Osteomyelitic Genu Recurvatum.** By Kisch, Prague, in *Beitr. z. klin. Chir.*, vol. xli, No. 2; abstr. from *Journ. Am. Med. Assoc.*, Aug. 13, 1904.

Kisch describes 2 cases, both in eighteen-year-old patients. The epiphysis was forcibly liberated in the first case without the use of the knife, but this intervention induced fat embolism, rapidly fatal. The danger of this should deter from bloodless reposition, he thinks, and advocates, instead, linear osteotomy at the point of the deformity, with extension and the covering of the cleft in the bone with the patella taken up in a flap comprising both skin and bone.

338. **Treatment of Fracture of the Patella by Lateral Sutures.** Joseph A. Blake, New York. *Jour. Am. Med. Assoc.*, vol. xliii, Oct, 1. 1904, No. 14.

The author draws a clear distinction between "blow" and "tear" fractures; the former yielding as a rule good results to mechanical treatment because of the little separation of the fragments and the slight danger of any aponeurotic "frills" preventing union of fragments. Where, however, as in a "tear" fracture, the aponeurotic structures are torn, the open operation is by all odds the best. He emphasizes the importance of the lateral expansions of the insertion of the quadriceps as true ligaments of extension and declares that in the "tear" fracture no operation is correct which does not repair these.

The operation of perfect coaptation by means of lateral repairing sutures is described in detail and illustrated by clear drawings and good skiagraphs. He reports twenty-two results; two are too recent for final report, but in the remaining number he obtained firm union and had no infections.—*Robert B. Osgood, Boston.*

339. **A New Method of Treatment of Habitual Luxation of the Patella.** By W. Böcker, Berlin. *Zeitschrift f. orth. Chir.*, Bd. XIII, Hefte 2 und 3.

Writer reports a case in which patella was luxated on outer side and quadriceps very weak. Therefore the semimembranosus was brought about in front and attached to the upper inner edge of the patella. Anatomical and functional results were good.—*Henry O. Feiss, Cleveland, O.*

340. **The Treatment of Inveterate Luxation of the Patella. Osteotomy of Femur and Inward Rotation of the Lower Epiphysis.** By Ernst Graser. *Langenbeck's Archiv*, vol. lxxiv, No. 2.

We can distinguish several varieties of luxation of the patella: recurrent, habitual and permanent; this last can be subdivided into reducible and nonreducible. One case was treated as follows: Tenotomy of biceps, vastus externus, semimembranosus and semitendinosus. A wedge-shaped osteotomy is now made on the inner side of the femur, the breadth of the base being 1½ cm. The inward rotation is now made and the wound is sewed up tight after which a retentive plaster is applied. When only weakness and laxity of the capsule exist, the above method should not be used; but it is indicated in cases where genu valgum exists.—*Carl Hiller, Cincinnati.*

341. The Recognition of Tuberculosis and Osteomyelitis of the Patella. By W. Röpke. *Langenbeck's Archiv*, vol. lxxiii, No. 2.

Statistics of Alfer show the frequency of this form of tuberculosis. Out of 1752 cases of bone and joint tuberculosis the patella was involved twice. Trendel showed that the patella was involved once in 1058 cases of osteomyelitis. Röpke carefully studied the circulation of the patella by the Lexer method of injections into the vessels of mercury turpentine emulsion and then subjecting the injected patella to radiography. From his studies he believes that the process starts as an embolus of low virulence in the tubercular form. An abscess forms which remains latent and incapsulated for a long time. The process starts in the anterior portion of the patella at the center of ossification in the tuberculous as well as the infective osteomyelitis. The knee joint and bursæ in the neighborhood become secondarily involved. The treatment is to remove all the diseased tissue by operative interference.—*Carl Hiller, Cincinnati.*

342. Avulsion of the Tibial Tubercle. By G. A. Wollenberg. *Deut. méd. Woch.*, Oct. 20, 1904.

Müller, in 1888, collected 7 cases of this condition from various authors, in addition to one of his own. Since then others have reported cases including Schlatter, who has contributed 8 cases. These were males between the ages of twelve and seventeen, and were an injury of the "beak-shaped" process of the upper tibial epiphysis. In no one of these was there a complete separation of this process from the tibia. The cause was usually direct violence, often slight, sometimes indirect, (as a result of forcible contraction of the quadriceps femoris). It is necessary to differentiate between this condition, occurring in adolescence, and that rarer condition, found in adults, where there is a true rupture of the spine of the tibia. This is due to the bony union existing between this "beak-shaped" process and the diaphysis of the tibia. The nearer the individual is to the age when the tibial tubercle begins to develop, the more readily will only the tip be affected. On the other hand, rupture of the tibial tubercle takes place more easily during the commencement of the union of the epiphysis and diaphysis. Wollenberg describes a case of rupture of the tibial tubercle, in a man of 23, following forcible contraction of the quadriceps; this, he thinks, in most cases, is the etiological factor. The prognosis seems to be a favorable one. The treatment is protective, ordinarily an adhesive plaster bandage applied so as to draw the fractured portion downward, is sufficient. In cases where the rupture of the tubercle is complete, fixation on the tibia, by operation, is to be considered. Should a slight disability of the limb result, massage and gymnastics will quickly relieve it. Five illustrations and a bibliography accompany the article.—*David Townsend, Brookline, Mass.*

FOOT.

343. Flat-foot in the Child. By Selter. *Jahrbuch f. Kinderheilkunde*, N. F. 57, Heft 6; review from *Archiv f. Orthopaedie*, Band II, Heft 3.

Selter claims the cause of acquired flat-foot in children to be the disproportion between the length and the breadth of a child's foot together with the fact that the navicular and cuneiform bones are not completely ossified at the time of the first attempts at walking.—*Walter G. Stern, Cleveland.*

344. Metatarsus Varus Congenitus. By Cramer. *Archiv f. Orthopaedie*, Band II, Heft 3.

Congenital varus position of the metatarsal bones without other deformity seems to be a most rare condition. Cramer knows of no other case. Acquired metatarsus varus is not at all uncommon, being seen in cases of severe genu valgum and pes varus. Röntgenograms illustrate the article.—*Walter G. Stern, Cleveland.*

345. **Hyperdrosis Pedum and Its Treatment by Baths of Permanganate of Potash.** By Ludwig Weirs, M.D., New York. *Jour. Am. Med. Assoc.*, vol. xliii, Aug. 6, 1904, No. 6.

After defining the condition and devoting considerable space to the physiology of perspiration, the author considers the etiology and symptoms.

Under the head of treatment he holds that so long as the universal custom of wearing irrational and unhygienic footwear continues, we can only look for temporary cures. He believes that only local treatment is available and describes the methods most commonly used.

The permanganate foot-bath is urged as being devoid of danger and followed by fewer relapses. Its action consists in its reducing power and consequent keratization of the epidermis. The essentials of the method are as follows: Thorough cleaning of the feet with borax, soap and water, followed by a rub with benzine. After this the feet are placed in a 1 per cent. solution of permanganate at 104° F. and allowed to dry without wiping. In the morning the feet are dusted with the following powder:

Potass. permanganatis	13.0
Aluminis	1.0
Talci	50.0
Zinci Oxidi	
Lapidis calamin āā	18.0

The interphalangeal spaces and possible fissures are carefully dusted and separated with absorbent cotton. On successive nights the same treatment is continued, the solution being increased in strength until the beginning of the second week, when the strength is 3 per cent. and the last three baths are 6 per cent. Blotting paper in the soles, a daily change of stockings, and low shoes complete the treatment, the dusting powder being kept up after the cessation of the baths.—*Robert B. Osgood, Boston.*

SHOULDER.

346. **Contribution to the Study of Congenital Elevation of the Scapula.** By H. J. Lameris. *Langenbeck's Archiv*, vol. lxxiii, No. 2.

This condition was first recognized by Eulenberg and later by Sprengel in 1891, who described 4 cases. Now there have been 50 cases reported. Lameris gives very carefully drawn-up measurements and shows several photographs of the condition. The condition may be due to a pathologic contraction of the rhomboid muscles, which produces a connection between the base of the scapula and the spinal column. Sometimes the upper and sometimes the lower muscle is involved.—*Carl Hiller, Cincinnati.*

347. **Treatment of Stiff Shoulders.** By A. Schanz. *Archiv f. Orthopaedie*, Band II, Heft 3.

The shoulder joint seems especially predisposed to immobility. Patients do not generally notice stiffening in this joint until long after its occurrence on account of their ability to protect the joint after trauma by fixing the shoulder and moving the scapula. Immobility of the shoulder can be successfully combated by massage and passive motion, but much more rapidly when gentle measures are used than when brisement forcé is resorted to. Schanz places the arm in abduction (under narcosis) and holds it in this position and immediately begins with a mobilizing treatment.—*Walter G. Stern, Cleveland.*

BONES AND JOINTS.

348. **Bone Cysts.** A Consideration of the Benign and Adamantine Dentigerous Cysts of the Jaw and Benign Cysts of the Long Pipe Bones. Joseph C. Bloodgood, Baltimore. *Jour. Am. Med. Assoc.*, vol. xliii, Oct. 15, 1904, No. 16, p. 1124.

Bloodgood pleads for conservative operative measures in many of the types. He declares that experience has shown that curetting is sufficient in the benign bone cysts of the long pipe bones, the dentigerous cysts of the jaw and the medullary giant-cell sarcoma; in the various forms of epulides of the upper and lower jaws; the periosteal and medullary giant-celled sarcoma; the periosteal fibro-sarcoma and osteo-sarcoma; the myxochondro sarcoma and the cystic adamantine epithelioma, resection, the extent of which is determined by the local infiltration, should be performed. Several groups of cases with results are given. Group one includes cases of the above types with cures. Group two includes those uncured because the case was inoperable when presented or because of death from internal metastases. The periosteal tumors include 6 cases of spindle- and round-cell sarcoma; 2 cases of perithelial angio-sarcoma. The medullary tumors include 4 cases of spindle- and round-cell sarcoma; 2 cases of perithelial angio-sarcoma; 6 cases of sarcoma of upper jaw involving the antrum; 21 cases of carcinoma of the upper jaw. He discusses at length benign bone cysts, benign dentigerous cysts and adamantine epithelioma, emphasizing the importance of recognition of the varieties by means of microscopic examination through exploratory incisions or experienced interpretation of the Röntgen negatives. The article is fully illustrated and a discussion by Dr. F. J. Hall follows.—*Robert B. Osgood, Boston.*

349. **Treatment of Cold and Abscesses and Sinuses in Tuberculous Bone Lesions.** V. P. Gibney. *Jour. Am. Med. Assoc.*, vol. xliii. Oct. 29 1904, No. 18,

Dr. Gibney's article is a most valuable contribution, embodying his very great experience with nearly all the methods which have been at one time or another advocated. It cannot better be abstracted than by repeating his conclusions verbatim, summing up, therefore, the claims made in this communication: 1. Early recognition of cold abscesses will enable one to dissipate or to nip them in the bud. 2. When they are present at the time the cases come under observation, treat them with indifference so long as they do not interfere with the proper adjustment of good protection apparatus. 3. If they are in the way, or if they show a disposition to burrow and encroach on parts that it is desirable to keep free from such invasion, resort to aspiration and make cultures in order to determine their virulency. 4. If aspiration fails, rely on incisions under rigid asepsis, large enough only to permit evacuation of the contents, and refrain from the introduction of chemicals. Close the wound by suture under the same rigid asepsis. 5. When the abscess lies directly over a bone focus that can be easily reached, make the incision large enough to remove the focus, and at the same time permit removal by curette or scissors of the lining of the sac and all necrotic tissue contiguous thereto. Then close aseptically, employing drainage for not over forty-eight hours. 6. If longer drainage is demanded, devise means by which asepsis in dressings may be continued indefinitely, and look on a mixed infection as a calamity. 7. Sinuses should be well drained, the foci upon which they depend should be treated if involving joints by perfect and long-continued immobilization, with due regard to fresh air and a high state of nutrition.—*Robert B. Osgood, Boston.*

350. **Tubercular Osteomyelitis of the Shafts of Long Bones.** By F. v. Friedlander, Vienna. *Deuts. Zeits. f. Chir.*, vol. lxxiii, Nos. 1–3.

The author reports 15 cases of this condition which occurred in two years in the new Wilhelmien Hospital. Seven of these were male and eight female. The ages ranged from two to eight and a half years. The ulna and tibia seem especially liable to be involved. To a less extent the humerus, radius and femur are involved. He goes into the pathologic anatomy in a thorough manner and classifies anatomically in three groups after Reichel:

1. Extension of a primary joint or epiphyseal tuberculosis.
2. Primary in spongiosa of diaphysis with or without concomitant, independent epiphyseal involvement. In this group the disease manifests itself as:
    (*a*) Granulation tissue focus.
    (*b*) Sequestrum.
    (*c*) Progressive infiltrating caseation.
3. The real primary tuberculous osteomyelitis which occurs:
    (*a*) In circumscribed foci.
    (*b*) Diffused throughout the whole marrow canal, associated usually with partial sequestration.

The triviality of the subjective symptoms is often contrasted with the gravity of the local manifestations. The diagnosis, he says, is easy in the later stages of the disease. In the early stages the Röntgen ray enables us to show changes in the bone. The treatment consists in removal of the tubercular focus whenever possible, and filling up the cavity with the iodoform plug used by v. Mosetig-Moorhof.—*Carl Hiller, Cincinnati.*

351. **Transplantation of Portions of Bone Unconnected with the Periosteum for the Cure of Pseudarthrosis and Bone Cavities. By F.** von Mangoldt, Dresden. *Langenbeck's Archiv*, vol. lxxiv, No. 2.

The method which he used is as follows: In two cases the periosteal bone flap was taken from the anterior and inner surface of the tibia. The saphenous vein and nerve are to be saved. The incision is a trap-door one with the base internally; being made broad enough to remove that portion of bone which is necessary. The periosteum is now circumscribed with a knife and with a flat chisel, a thin lamella of bone is removed with it. Since there is some shrinkage of the flap it is advisable to cut it rather large so that the cavity may be completely filled in. With a chisel cuts can be made into the bone without wounding the periosteum, so that the flap will readily adapt itself to all irregularities of surface. The bone flap is applied in the same relative position as it occupied before being liberated. Before applying the flap all capillary bleeding should have been stopped. The soft parts should now be brought together and a small amount of drainage inserted. After some time had elapsed in the 2 cases reported they were subjected to radiography which revealed the permanent union of the bone flap and the diaphysis.—*Carl Hiller, Cincinnati.*

352. **Pathogeny of Osteomalacia or Senile Atrophy.** Eugene S. Talbot, Chicago. *Jour. Am. Med. Assoc.*, vol xliii, July 23, 1904, No. 4, p. 247.

The author considers that in osteomalacia some disturbance of metabolism is the etiological factor of importance and that it may occur in any state where there is a lack of balance. He contends that the alveolar process is an ideal place to study the condition because of its accessibility and its susceptibility to metabolic changes and hence the ability to study the process earlier and with more accuracy than in the pelvic or other bones.

The disease is more likely to occur in degenerates, and he considers that even the mildest forms of autointoxication or drug poisoning may be the potent etiological factor. Osteomalacia is common among the domestic animals and wild animals in captivity but the influence of bacteria has not been demonstrated by Koch's law.

On the theory of autointoxication an attempt to increase the elimination would seem to be the rational line of treatment. Illustrations of the macroscopic and microscopic appearances add to the value of the paper.—*Robert B. Osgood, Boston.*

353. **Old Unreduced Dislocations.** De Forest Willard, Philadelphia. *Jour. Am. Med. Assoc.*, vol. xliii, Sept. 24, 1904, No. 13.

The terms "unreduced dislocation" is used to cover cases where the joint surfaces remain luxated for a month or more after the accident.

The importance and care in correct diagnosis is emphasized and the operator cautioned against accidents, of rupture of large vessels or nerve trunks by too forcible manipulation of the old methods of pulley traction.

The various operative procedures manipulative and through open incision are considered for the different joints, illustrative cases being given. He considers it unwise to do a cutting operation immediately after severe manipulative procedures, when the tissues are especially susceptible to infection. The author takes a rather discouraging view of attempt by arthroplasty to prevent the union of joint surfaces. He considers the best method the turning in of a flap of fascia or connective tissue. Passive motion as an after-treatment should be begun very early. Electricity, massage, voluntary and involuntary movements should be continued for a long time and require pluck on the part of the patient.—*Robert B. Osgood, Boston.*

354. **Diplococcus Polyarthritis.** By Baduel. *Riforma Medica*, vol. xx, No. 26; abstr. from *Journ. Am. Med. Assoc.*, Aug. 27, 1904.

Baduel's patient had first an acute pneumonia. This was followed by a slow suppurative process in the pleura in the course of which developed what was apparently an articular rheumatism, but was found to be a diplococcus affection. The syndrome had many points in common with what Marie has described as "pneumic osteo-arthropathy deformans." The joints were enlarged and the nails curved. Marked improvement was observed after a course of treatment with a solution of Castrocaro salts.

355. **Surgical or Traumatic Rheumatism, with a Note on the Use of Coingan's Button.** By James Weir. *Glasgow Med. Jour.*, July; abstr. of abstr. in *Jour. Am. Med. Assoc.*, vol. xliii, July 30, No. 5.

The author describes a traumatic periarthritis in which trauma or occupation are the commonest etiological factors. He says that "Treatment by means of the actual cautery is the only therapeutic exhibition which has yielded any successful result in the hands of the author."—*Robert B. Osgood, Boston.*

356. **Further Experience with Streptolytic (Antistreptococcic) Serum in Rheumatism.** By George H. Sherman, Detroit. *Jour. Mich. State Med. Soc.*, vol. iii, No. 6, June, 1904.

The favorable action of streptolytic serum on acute rheumatism, which is caused perhaps by a specific micro-organism not identical with the streptococcus, is explained by the probably close relationship of these two species of micrococci.

Twenty-seven cases in all were treated with the serum. Of the 6 cases treated during subacute recurrences of previous acute attacks, 3 were entirely cured, 2 much benefited, and 1 showed no results. Of 6 chronic cases without initial acute attacks, 1 was much improved, while 5 were not benefited. Of the 15 acute cases, all made good and expeditious recoveries, and only one had a return of the disease (after one year); no heart complications developed, and the commonly consequent anemia and debility did not appear.

The chronic cases do not tolerate the serum so well as the acute, the initial dose for the former being 10 cc., and for the latter 20 cc.; in either case, the dose of 10 cc. is repeated three or four times at intervals of two or three days, urticaria beginning about the site of injection being the signal to discontinue for a week or two. The number of doses needed depends upon the virulence of the rheumatism.

"From what experience I have had, I think I am safe in predicting that where streptolytic serum is properly used in initial cases of acute inflammatory rheumatism, the lapse of the disease into a chronic condition from recurrences, with joint deformities, will be avoided, and that heart complications following this disease will be a thing of the past."—*William E. Blodgett, Detroit.*

357. **The Pathology and Etiology of Arthritis Deformans.** Thomas McCrae, Baltimore. *Jour. Am. Med. Assoc.*, vol. xliii, Oct. 8, 1904, No. 15.

He accepts in the main Goldthwait's classification of the atrophic and hypertrophic types, agreeing with him that for the present the classification is one for convenience of study and perhaps not implying absolutely separate identity. He limits the infectious type to those in which the bacterial agent is proved. He considers the relation of the disease to the so-called acute articular rheumatism only one of chance. He draws attention to the fact that the changes are not necessarily progressive. The atrophic type corresponds in the majority of cases to the polyarticular type. In the early stages only the synovia may be affected and a fair degree of recovery take place. In many cases, however, the cartilage becomes eroded and bone atrophy in the neighborhood of the joint occurs.

The periarticular structures may be involved and the subsequent condition varies from little impairment to complete uselessness. Ankylosis proper rarely results.

In the hypertrophic type outgrowth of bone is one of the prominent features. Erosion of cartilage and atrophy of joint surfaces occur as a rule with proliferation of bone and cartilage about the edges. The other types worthy of separate consideration are the spinal, the monarticular type and the so-called Still's disease. He considers the frequent association of the spinal form with changes atrophic or hypertrophic in other joints, an argument for the unity of the disease. He calls attention to the frequent nerve root pressure simulating sciatica.

The monarticular type occurring usually in advanced life involves most often the hip or the shoulder and may be atrophic or hypertrophic. It is an unfortunate term if used to describe a type. The only distinctive feature McCrae discovers in the so-called Still's disease is its limitation to childhood which he does not consider essential.

Etiology: Under this head the author considers: (1) Neural origin; (2) the presence of a definite infection; (3) the presence of various infections. The neural origin he believes improbable. The specific infection he considers the most reasonable view. As to the theory of various infections, McCrae seems to be in doubt and able to present evidence both for and against. There follow statistics of 120 cases without any striking conclusions as to etiology. The colored race seems more susceptible than the white. The conclusions are appended.

The conclusions which may be made are as follows:

1. That there are two great types of cases, the atrophic and hypertrophic, which are probably varying manifestations of the same disease.
2. That there are many variations, such as the spinal forms, the so-called monarticular form, the form occurring in children, etc., which are probably all arthritis deformans.
3. That the etiologic factor is not determined, but our present knowledge points to its being an infection of some nature.
4. That no opportunity of pathologic and bacteriologic examination should be neglected.—*Robert B. Osgood, Boston.*

358. **The Treatment of Arthritis Deformans.** Clarence Edward Skinner, New Haven. *Jour. Am. Med. Assoc.*, vol. xliii, Oct. 8, 1904, No. 15.

Under modern treatment, Skinner takes a more helpful view of the treatment of arthritis deformans than history would indicate. The most important step is the early diagnosis. The diet should be generous without restriction of meat and with attention to intestinal indigestion. He advises woolen underclothing; light in summer and heavy in winter. In the acute stages "physiological rest" of the affected joints is urged. After the acute stage should come judiciously regulated active and passive movements gradually increasing. Forcible sudden breaking down of ankylosis, the author believes of no benefit. The general medical treatment should consist in the tonics and alteratives with salicylates, especially aspirin and local applications for temporary use in the relief of pain. No special drugs seem available. He speaks strongly in favor of the "physiologic therapeutics," including under this head, vibratory stimulation, dry hot air applied to the whole body, electricity and hydrotherapy. He describes his method of applying only hot air, calling it the sheet anchor of hope in the management of arthritis deformans. Several methods of applying electricity are somewhat enthusiastically indorsed and when available these, together with mechanical vibratory stimulation, largely take the place of massage. The general routine treatment is outlined and the statistics of 51 cases given, 9 classed as finally free from symptoms, 16 as greatly benefited, 11 as considerably benefited, 10 as slightly benefited, 5 as not benefited. In conclusion he emphasizes the fact that the prognosis is far less gloomy than in the past.

A discussion of the foregoing papers by Dr. Joel E. Goldthwait of Boston, Dr. Allen A. Jones and Dr. Delaney Rochester, both of Buffalo, follows.—*Robert B. Osgood, Boston.*

359. **Arthritis, Gonorrhoica and Trauma.** *Monatschr. f. Unfallheilk.*, 1904, No. 1; review by Grünbaum, *Arch. f. Orthopaedie*, Band II, Heft 3.

Although the author is somewhat skeptical as to any relationship between the two, he presents one case where the trauma was undoubtedly the causative factor. The patient had gonorrhea for only two weeks and the trauma which set up a "locus minoris resistentiæ" was a severe blow upon the wrist with a hammer. The early appearance of arthritis (second week), its primary appearance in the injured joint shortly after injury and its localization in only this one joint, point to a probable relationship between the trauma and the arthritis.—*Walter G. Stern, Cleveland.*

360. **Multiple Joint-contractures, Surgical Formation of Pseudarthroses in One Hip.** Prof. Froelich, Nancy. *Zeitschrift f. orth. Chir.*, Band XIII, Hefte 2 und 3.

Report of a case in which after a subtrochanteric osteotomy and removal of 1 cm. of bone, a strip of celluloid was placed between the bone ends. At the end of two months a pseudarthrosis has formed in flexion and abduction, but at the end of six months a bony callus had formed leaving the leg in abduction. However, the pseudarthrosis was lost.—*Henry G. Feiss, Cleveland, O.*

361. **The Treatment of Inflammatory Joint Contractures.** By Max Haudeck. *Zeitschrift f. orth. Chir.*, Band XIII, Hefte 2 und 3.

Writer refers especially to the use of hot-air treatment in combination with elastic traction.—*Henry O. Feiss, Cleveland, O.*

VOLUME II. APRIL, 1905. NUMBER 4.

The American Journal *of*
Orthopedic Surgery

I.

A STUDY OF ANGLES AND LINES DEFINING THE RELATIONSHIP BETWEEN THE PELVIS AND FEMUR.

STEWART L. M'CURDY, M.D., PITTSBURG, PA.

A married woman aged twenty-four years came to me with an ankylosed right hip joint following gonorrhea with secondary infection of this joint. My first measurement showed the right leg to be two inches short. Upon further examination about the trochanter I concluded that no dislocation existed, and I was satisfied that no destruction of the continuity of the bones from the pelvis to the malleolus had taken place. It occurred to me to place the left femur at the same angle to the pelvis as the right, and then make comparative measurements of the two sides. To my surprise no variation in length existed. I was led to the conclusion that in every case where measurements are made without regard to the angle of the femur to the pelvis, error must follow. The amount depends entirely upon the amount of flexion and adduction or other angular variation.

In a recent case under treatment with hip-joint disease, after the acute pain of abscess formation had passed away for many months and no acute symptoms were present, in which I had stated that the head of the bone was still in the acetabulum, a doctor of considerable prominence measured the legs and

Presented at the Eighteenth Annual Meeting of the Association, at Atlantic City, N. J., June 8–10, 1904.

reported that there was one inch of actual shortening. Later I saw the case and was convinced by my method of measurement that no actual shortening existed, but that the doctor had made a mistake because he did not place the two thighs at the same angle with the pelvis while measuring.

Having at my disposal about 100 disarticulated skeletons, I made a study of the relationship existing between the femur and the pelvis and found that it was possible to increase the distance from the anterior superior spine to the internal condyle two inches, while the arc through which the femur passed was no greater than that found in many cases of deformity at this joint. The models used included the innominate bone and a femur of the same skeleton in every instance, the bones

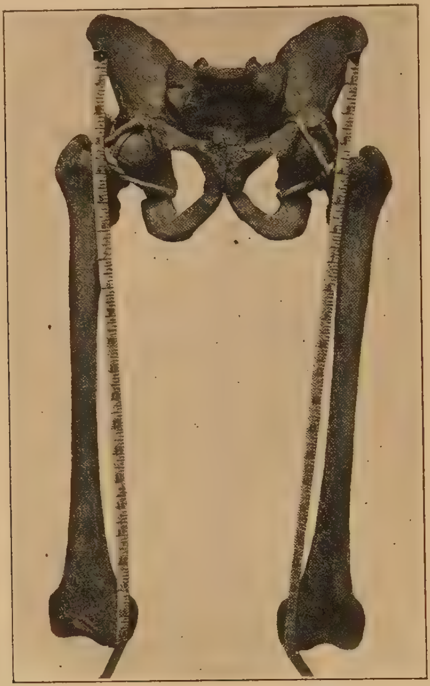

FIG. 1.

being held in articulation with rubber cords as shown. Several methods of holding these bones in position were used but the cords or rubber bands proved to be the best means of securing a joint permitting a range of motion most nearly approaching the normal.

If you will examine the skeletons I hand to the President, you will observe that a tape is nailed to the anterior superior

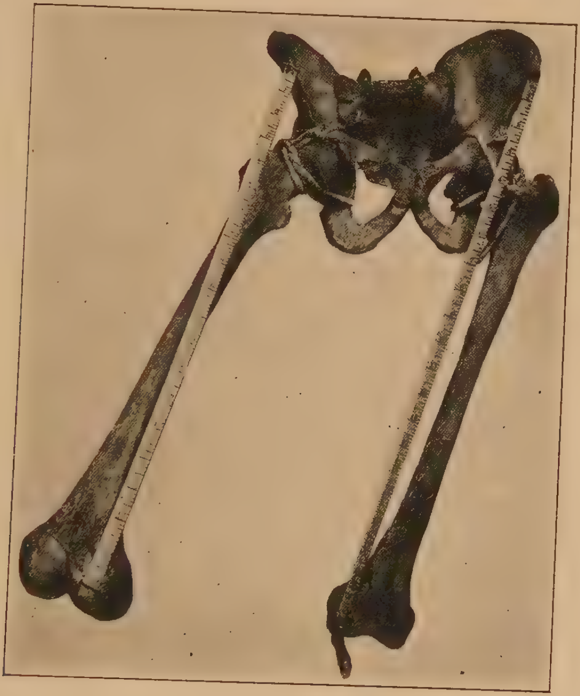

FIG. 2.

spine with the free end passing under a staple on the internal aspect of the internal condyle of the femur. If you now swing the femur about, at the same time keeping the tape tightly drawn, the variation in the distances between the two fixed points that have been selected will be at once observed.

The shortest distance between the two fixed points is when the thigh is in flexion, abduction, and eversion, while the greatest distance is in extreme extension, slight adduction and inversion.

Flex the femur to an angle of 44° and abduct to an angle of 45° in Fig. 1, the distance is found to be 19 including the shortest distance between these two points that would likely be found in any person.

If now the femur is extended to a plane with the pelvis, and adducted to 6°, the distance will be found to be 21 inches or a difference of 2 inches. The same variation is observed whether the measurements are made upon the skeleton or a living subject. (Fig. 2.)

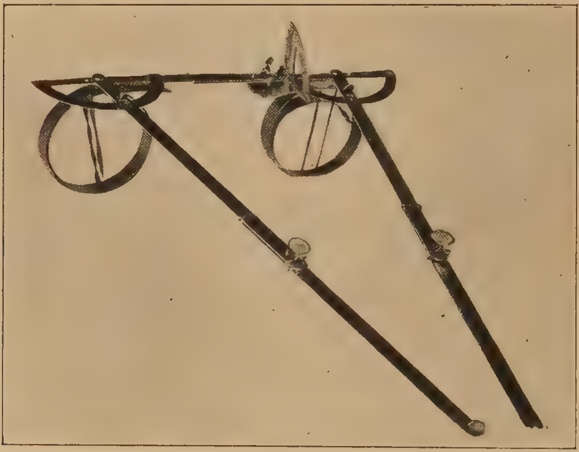

Fig. 3.

I desire to present an instrument with a description of the same, devised for the purpose of measuring the angular deformity at the hip joint.

It is composed of a graduated adjustable crossbar with a range from 5 to 10 inches, upon the ends of which are placed protractors. (Fig. 3.) From the pivot points of the protractors extends two graduated adjustable arms with a range of from 10 to 20 inches. When the arms are at right angles to the crossbar, they rest against the external surface of the patella. Upon the under surface of the ends of the crossbar there are hinged two plates to which also are secured springs that pass around and fit to the sides of the pelvis to hold the instrument in position. To the crossbar is secured a vertical protractor and from one of the hinged plates underneath an index passes upward alongside the vertical protractors. This is for the purpose of measuring the degree of flexion of the thighs upon the pelvis.

For simplicity the right angle position shows the instrument at 0. (Fig. 4.) When the leg is internal to a right angle, the degree of adduction is indicated upon the corresponding protractor, and if the leg is external to a right angle, the degree of abduction is indicated in the same way. The pivot point must be placed immediately over the anterior superior spine or the measurements will not be accurate. The instrument is also used for the purpose of placing the two thighs at the same angle with the pelvis while measurements are made for actual shortening. As has been pointed out in the paper, unless this is done a mistake of as much as 2 inches can very readily be made and without it there is no other way except by guessing that the thighs can be placed at the same angle with the pelvis.

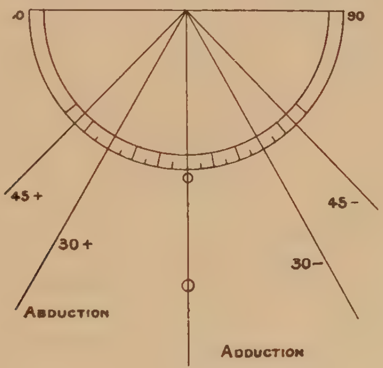

FIG. 4.

With the instrument the table that is submitted to determine the degree of abduction or adduction by measurements is not necessary.

The instrument which may be called a compound goniometer requires some changes to make it serve its purpose fully. The crossbar should be made of flexible steel so as to fit over a protruding abdomen. The crossbar and arms should be made with a greater range of adjustment. It will also be improved if two of these vertical indexed protractors are made, since the two sides are different and it is on the flexed side that it is to be used.

The method of selecting the external surface of the patella the point for the use of the instrument was made after examining quite a number of normal individuals. These people were asked to stand erect, in a natural attitude and upon both feet with equal weight. A plumb line was now held upon the anterior superior spine of the ilium. In practically every case examined the line rested immediately over, or against the external surface of the patella. This furnished a triangle, the perpendicular

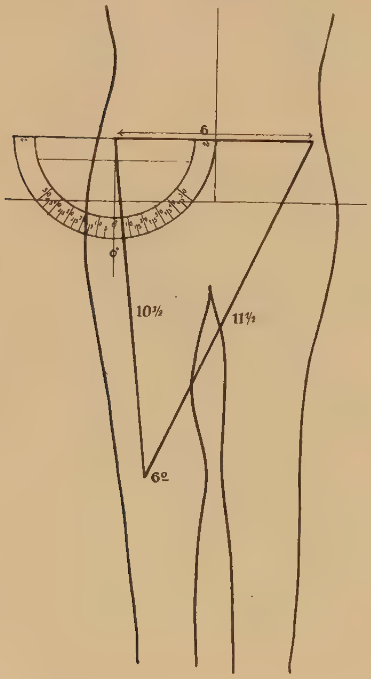

FIG. 5.

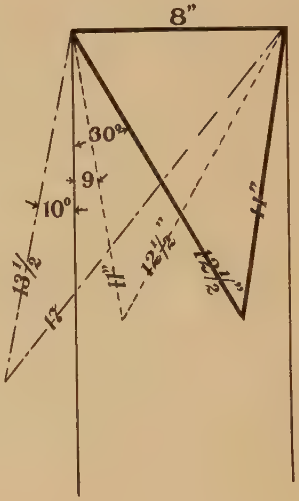

FIG. 6.

of which is from spine to spine, the base from left spine to left patella and the hypothenuse from right spine to left patella. The triangle is illustrated in the drawing Fig. 5 and Fig. 6.

I also desire to present tables of figures to take the place of the instrument already submitted.

It is for the purpose of properly estimating the degree of abduction and adduction by the use of a tape measure. The accuracy of the tables now in use must be questioned if the claim made in this paper that a mistake of one or two inches can be, and frequently is, made, when estimating real shortening, to say nothing of apparent shortening as estimated from such an indefinite point as the umbilicus.

5 Inches From Spine to Spine.

From spine on diseased side to outside of patella on same side.

From spine on well side to outside of patella on diseased side.	8	8.5	9	9.5	10	
6	41	45				Adduction in degrees.
6.5	35	40	45			
7	30	34	39	44		
7.5	24	28	33	38	43	
8	18	23	27	33	37	
8.5	12	16	22	27	31	
9	6	11	16	21	26	
9.5	0	5	9	15	20	
10	7	1	3	10	15	
10.5	15	8	3	3	9	
11	22	15	9	3	2	
11.5	31	23	16	10	3	Abduction in degrees.
12	42	32	24	17	10	
12.5	....	42	32	24	17	
13	....	....	42	33	25	
13.5	....	....	....	43	34	
14	....	....	....	....	44	

The distance from S. to S. is represented in the large figure at the top of every table. The distance from the spine on the affected side is represented in the horizontal row of figures at the top of each table.

The column of figures to the left of each table represent the distance from the spine on the well side to the outside of the patella on the diseased or displaced side.

The figures in the center of the table represent the degrees of deformity. Those in the upper half of each table represent adduction and those in the lower half abduction.

A separate table is required for every distance across the pelvis. Half inches are used only, but this it was thought was sufficiently accurate for all practical purposes.

It will be argued that the outer surface of the patella is an indefinite point, but if the foot is placed in normal eversion or at an angle of about 15° and a point upon the patella and marked, error is not likely to occur.

6.

	9	9.5	10	10.5	11
6.5	44				
7	39	42	46		
7.5	34	38	42	45	
8	29	33	37	41	45
8.5	25	28	32	36	40
9	20	23	27	31	35
9.5	15	19	23	27	30
10	10	14	18	22	26
10.5	5	10	14	18	22
11	0	4	9	13	17
11.5	6	1	3	8	11
12	12	8	3	2	6
12.5	20	15	9	4	1
13	28	21	16	10	5
13.5	36	28	22	15	10
14	46	37	29	22	16
14.5	....	46	37	29	23
15	....	....	46	38	30
15.5	....	....	....	47	38
16	....	....	....	....	48

I have submitted here but three tables, *i. e.*, tables of figures for 5, 8 and 10 inches across the pelvis. In my paper however I expect to have tables for all distances from 5 to 14 inches, from spine to spine.

So far as I have been able to find out up to this time, it is impossible to make one table of figures that will include all sizes of the triangle and the degrees of deformity. Some mathematician may, from what works I have done, be able to do so.

1. Owing to inaccuracy in making measurements of the lower extremities to estimate displacements at the hip joint, it is proposed to place the two femurs at the same angle with the pelvis when measurements are made.

2. A new triangle is proposed for estimating adductions and abductions of the femur. This triangle has for a base, a line drawn from the anterior superior spine of diseased side to the outside of the patella on the same side. The perpendicular is from spine to spine. The hypothenuse is a line drawn from the spine of the well side to the outside of the patella on the affected side.

7.

	10	**10.5**	**11**	**11.5**	**12**	**12.5**
7	45					
7.5	41	44				
8	37	41	43			
8.5	33	36	39	42	46	
9	29	32	35	38	41	45
9.5	25	28	31	34	37	41
10	20	24	27	30	33	37
10.5	16	19	23	26	29	33
11	12	15	19	22	25	29
11.5	7	11	14	18	21	25
12	2	6	10	13	17	21
12.5	3	1	5	9	13	16
13	8	4	1	5	8	12
13.5	14	9	5	0	4	8
14	20	15	10	5	1	3
14.5	26	20	15	10	6	1
15	33	26	21	16	11	6
15.5	40	33	27	21	16	12
16		41	34	27	22	17
16.5			41	34	28	22
17				42	34	28
17.5					42	35
18						43

3. An instrument is shown to immediately estimate flexion, abduction, and adduction. It is a bilateral machine so that the two thighs can be placed at the same angle, to avoid mistakes, as suggested in the first paragraph of this paper.

8.

	11	11.5	12	12.5	13	13.5
8	44					
8.5	40	42	45			
9	36	39	41	44		
9.5	32	35	38	41	43	
10	29	31	34	37	40	43
10.5	25	28	31	33	36	39
11	21	24	27	30	33	35
11.5	17	20	23	26	29	31
12	13	16	19	22	25	28
12.5	9	12	16	19	22	25
13	5	8	12	15	18	21
13.5	3	4	8	11	14	17
14	8	0	3	7	10	13
14.5	13	4	0	3	6	10
15	18	8	5	0	2	6
15.5	23	13	9	5	6	2
16	29	18	14	10	10	1
16.5	36	24	19	15	15	6
17	42	30	24	20	20	11
17.5	....	35	30	25	25	15
18	....	42	36	30	31	20
18.5	....	....	43	37	37	26
19	....	....	....	44	44	31
19.5	....	....	....	....	....	37
20	....	....	....	....	....	44

9.

	12.5	**13**	**13.5**	**14**	**14.5**	**15**
9	44					
9.5	41	43	45			
10	37	40	42	45		
10.5	34	37	39	41	44	
11	31	34	36	38	41	43
11.5	27	30	32	35	37	40
12	25	27	29	32	34	37
12.5	21	24	26	29	31	34
13	18	20	23	25	28	30
13.5	14	17	19	22	25	27
14	11	13	16	19	21	24
14.5	7	10	13	15	18	21
15	3	6	9	12	15	17
15.5	1	2	5	8	11	14
16	5	2	2	5	8	11
16.5	9	6	2	1	4	8
17	13	10	6	3	0	4
17.5	18	14	10	7	4	0
18	23	19	15	11	7	4
18.5	29	24	20	16	12	8
19	34	29	24	20	16	12
19.5	40	34	29	25	20	16
20	....	40	34	29	25	20
20.5	....	....	40	35	30	25
21	....	....	....	41	35	30
21.5	....	....	....	....	45	35
	....	....	....	....	....	42

10.

	14	**14.5**	**15**	**15.5**	**16**	**16.5**
10	44					
10.5	41	43				
11	38	41	43	45		
11.5	36	37	40	42	44	
12	33	35	37	39	42	44
12.5	30	32	34	36	39	41
13	27	29	31	33	36	38
13.5	24	26	28	30	33	35
14	21	23	25	28	30	32
14.5	18	20	22	25	27	29
15	15	17	19	22	24	26
15.5	11	14	16	19	21	23
16	8	10	13	16	18	20
16.5	5	7	10	13	15	17
17	1	4	7	10	12	14
17.5	2	0	3	6	9	11
18	6	3	0	3	6	8
18.5	10	6	3	0	3	5
19	13	10	7	4	0	2
19.5	17	14	10	7	4	5
20	21	18	14	11	8	9
20.5	25	22	18	15	12	12
21	30	26	23	19	15	16
21.5	35	31	26	22	19	20
22	42	36	32	27	23	24
22.5	....	42	37	32	28	29
23	....	....	43	37	33	34
23.5	....	....	....	43	37	38
24	....	....	....	....	43	44
24.5	....	....	....	....	....	....
25	....	....	....	....	....	....

11.

	16	16.5	17	17.5	18	18.5
11.5	44					
12	41	43	45			
12.5	39	41	43	45		
13	36	38	40	42	44	
13.5	34	35	37	39	41	44
14	31	33	35	37	39	41
14.5	28	30	32	34	36	38
15	26	27	30	32	34	36
15.5	23	25	27	29	31	33
16	20	22	24	26	29	30
16.5	17	19	22	24	26	28
17	15	17	19	21	24	26
17.5	12	14	16	18	21	23
18	9	11	13	15	18	20
18.5	5	8	10	13	15	17
19	3	5	7	10	13	15
19.5	0	2	4	7	9	12
20	4	1	1	4	6	9
20.5	7	4	2	1	4	6
21	10	8	5	2	1	3
21.5	14	11	8	5	3	0
22	18	14	11	8	6	3
22.5	22	18	15	12	9	6
23	26	22	18	15	12	9
23.5	30	26	22	19	15	12
24	34	30	26	23	19	16
24.5	39	35	30	27	23	20
25	45	40	35	31	27	23
25.5	....	45	40	36	31	27
26	....	....	45	40	36	31
26.5	....	....	....	45	40	35
27	....	....	....	....	45	40
27.5	....	....	....	....	....	46

12.

	17	17.5	18	18.5	19	19.5	20
12	45						
12.5	43	45					
13	40	42	44				
13.5	38	40	41	44	45		
14	35	37	39	41	43	45	
14.5	33	35	37	39	40	42	45
15	31	32	34	37	38	40	42
15.5	28	30	32	34	36	37	39
16	26	27	29	31	33	35	37
16.5	23	25	27	29	31	33	35
17	21	22	24	27	28	30	32
17.5	18	20	22	24	26	28	30
18	15	17	19	21	24	26	27
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19	10	12	15	17	19	21	23
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20	5	7	9	11	14	16	18
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24	21	18	14	12	9	6	4
24.5	25	22	18	15	12	9	7
25	28	25	22	18	15	12	10
25.5	32	29	25	22	18	15	13
26	37	33	29	26	22	19	16
26.5	41	37	33	29	26	23	19
27	....	42	37	33	30	26	23
27.5	....	....	42	38	34	30	26
28	....	....	....	43	38	34	30
28.5	....	....	....	....	43	38	34
29	....	....	....	....	....	43	39
29.5	....	....	....	....	....	....	43
30	....	....	....	....	....	....	....

13.

	18	**18.5**	**19**	**19.5**	**20**	**20.5**	**21**	**21.5**
13	44							
13.5	42	44	45					
14	40	41	43	44				
14.5	38	39	41	42	44	45		
15	35	37	38	40	41	43	45	
15.5	33	34	36	38	39	41	43	44
16	31	32	34	36	37	39	41	42
16.5	29	30	32	34	35	37	38	40
17	26	28	30	31	33	35	36	38
17.5	24	26	27	29	31	33	34	36
18	22	24	25	27	29	30	32	34
18.5	19	21	23	25	26	28	30	31
19	17	18	20	22	24	26	27	29
19.5	14	16	18	20	22	24	25	27
20	12	14	15	17	19	21	23	25
20.5	10	11	13	15	17	19	21	23
21	7	9	11	12	15	16	18	20
21.5	4	6	8	10	12	14	16	18
22	1	4	6	8	10	12	14	16
22.5	2	1	3	5	7	9	11	13
23	4	2	0	2	4	7	9	11
23.5	7	5	3	0	2	4	6	8
24	10	8	5	3	1	1	4	6
24.5	13	11	8	6	3	1	1	3
25	16	14	11	8	6	4	1	1
25.5	19	17	14	11	9	6	4	2
26	23	20	17	14	12	9	7	5
26.5	26	23	20	17	15	12	9	7
27	30	26	23	20	18	15	12	10
27.5	34	30	27	23	21	18	15	13
28	38	34	30	27	24	21	18	16
28.5	43	38	35	30	28	24	21	19
29	....	43	39	35	32	28	25	22
29.5	....	....	44	39	36	32	29	26
30	....	....	....	44	40	36	32	29
30.5	....	....	....	....	44	40	36	32
31	....	....	....	....	....	44	40	36
31.5	....	....	....	....	....	....	45	41
32	....	....	....	....	....	....	....	45

Dr. Royal Whitman said that he was glad that attention had been called to this subject and that the result had been tabulated. The influence of abduction and adduction on measurements must be familiar to all. It is absolutely impossible to measure the relative length of the limbs in false positions by the ordinary methods. One limb may be as long as the other because of abduction when in reality a real shortening exists. The question has not been worked out as it should be, but this seems to be an advancement in the right direction.

Dr. Hoffa said that he considered it a very valuable paper. It is of the greatest importance for us to know the difference in the length of the femurs. In Germany we have taken great care with these matters and there is now on exhibition in St. Louis a similar instrument by means of which we can determine whether abduction or adduction exists and measure them.

Dr. Judson said that in many cases of knock-knees and bow-legs it would be necessary to take the deformity into consideration in taking such measurements.

Dr. Freiberg said that the great element of uncertainty still obtains in this method that we have had all along. It is very difficult to tell just where the tip of the great trochanter lies. Radiograms show that the line which is supposed to pass through the pubic spines does not touch the pubic spines at all, but falls below. The great trochanter is so large that it is far from easy to measure with an accuracy of less than half an inch, particularly in an adult.

Dr. Reginald H. Sayre said that he was in doubt as to the method of keeping the angle of flexion the same in both limbs. Of course the flexion was indicated on the protractor and the same was true of the crossbar.

Dr. McCurdy in closing the discussion said that he was now having made an instrument which would be an improvement over the one shown. There would be a vertical protractor on the same side in order to more perfectly keep the angle of flexion the same in both sides. He wished particularly to make the distinction between the terms tip and eminence as referred to the great trochanter. The eminence is that part which lies nearest to the skin. If a line be drawn across the pelvis it will be found that the pubic spines are directly in front of the superior portion of the arch. This line is always above the trochanteric eminence. This will be a distance of over an inch in some cases, because of the acuteness of the angles of the femurs. In older people the angle increases and of course the trochanter rises toward the pubic spine. An error of half an inch may be possible but in cases of fracture there is a dislocation of an inch or two inches. Nelaton's line is very inaccurate.

II.

TRANS-PELVIC LINES FOR DETERMINING DISPLACEMENT AT THE HIP.

STEWART L. M'CURDY, M.D., PITTSBURG, PA.

There is no one condition in surgery that causes more anxiety than injuries and diseases about the hip joint when there is a question as to whether there is a dislocation of recent origin or of congenital origin, and especially when there is a fracture of the neck of the femur with only a minor degree of deformity.

Nelaton's line is inaccurate in the most skilful hands. Its correctness depends upon an observation of the course of the tape around over the greater trochanter from the anterior superior spine to the tuberosity of the ischium. An eye well trained in angles and proportions will see whether the tape is at a right angle with the long axis of the body and over the highest point of the trochanter. It is so easy, however, to have the trochanter vary an inch and the tape still appear to pass over the trochanteric eminence.

Bryant's triangle has fallen into disuse and is not mentioned in many of the modern surgeries.

The line I propose, which has served most satisfactorily in my practice, is one that crosses the pelvis through the spines of the pubic bones at right angles to the median line, the umbilicus serving as the vertical of the triangles. This line extends outward across the hip joints, passing over or above the trochanteric eminences where the heads of the femurs are in the acetabulum and no fractures of the neck or displacements of this femur exists (Fig. 1).

I have examined several hundred patients by this method since determining its practical use, and it has permitted me

Presented at the Eighteenth Annual Meeting of the Association, at Atlantic City, N. J., June 8–10, 1904.

to decide almost instantly whether displacement at the hip joint existed. It is easily applied to patients of all ages. The patient with hip injury is invariably lying on the back, just the correct position for its application, while Nelaton's line is not so readily applied in this position.

The skeleton herewith shown is that of a person about eighteen years old, as you can see by the nonunion of the crests of the ilium. In this skeleton the flexible wire which passes through the pubic bones immediately back of the spines is slightly above the trochanteric eminences.

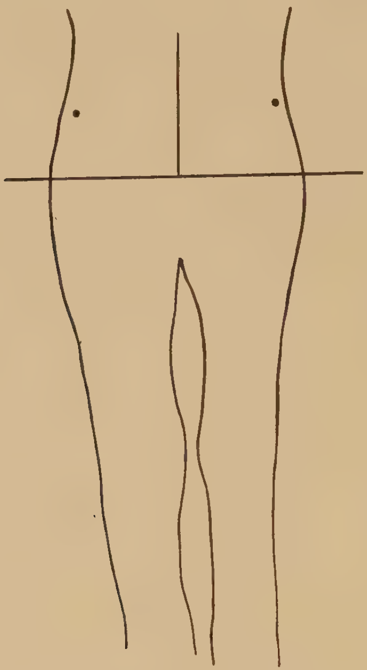

FIG. 1.

As is well known the acuteness of the angle of the neck of the femur increases from childhood up to adult manhood. In adult life the trochanteric eminences are always at least one inch below the transpubic line. It is at this age that we find the greatest number of injuries with upward displacement of the trochanter, so that if this bone should be even to the line, fracture or dislocation must be suspected. If, however, it is above, there can be no question that an injury of some sort with hip displacement exists.

As age advances the angle of the neck of the femur diminishes in acuteness and the trochanter ascends.

In two cases over eighty recently examined for hip injury, the normal hip showed the trochanteric eminence immediately under the pubic line, but on the injured side the trochanter was one inch above in one case and one and three-fourths above in the other, showing unmistakable fracture of the neck in both cases (Fig. 2).

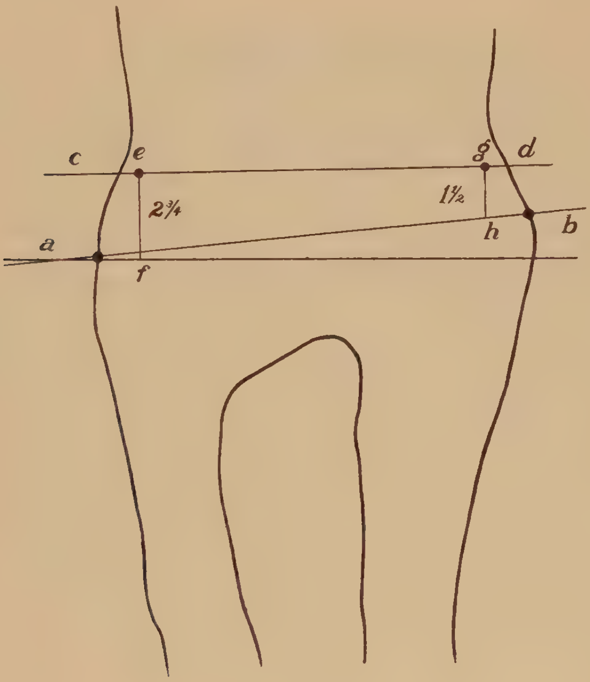

FIG. 2.

A young man aged twenty-five years and another aged seventeen years showed a trochanter one and one-half inches above the line on the injured side and slightly below on the normal side (Fig. 3).

I submit three radiograms for your inspection. One of congenital dislocation and two of hip-joint disease in various degrees of destruction. The line drawn across these pictures bisecting the pubic spines invariably crosses the trochanteric eminences in the well hips or those without displacement and in the displaced hips the trochanters are always above, and in one, as much as two and one-half inches.

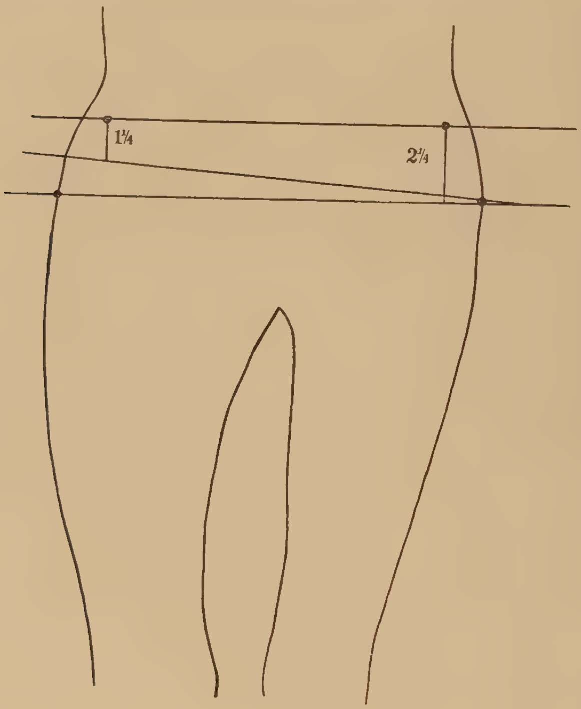

Fig. 3.

There is another way in which the trochanteric line may be used to verify the conclusion found by the method above described.

A tape measure, ruler or string is passed across the pelvis so that the ends cross the trochanteric eminences and are held in this position by an assistant, or a line may be made across the abdomen from trochanter to trochanter. Care must be taken that the most prominent points of the trochanter are found.

The anterior superior spines are now located and marked. Or a line may be made across the pelvis over the spines if desired. If these lines are parallel no displacement at the hip joint exists. If, however, the lines converge, displacement of some sort will be found on the side where the lines are closer. The amount of displacement is now determined from the spines to the points on the trochanteric line immediately below.

FIG. 4.—TUBERCULAR HIP, WITHOUT DISPLACEMENT, SHOWING TRANSPUBIC LINE BISECTING TROCHANTERIC EMINENCE.

The illustration from *a* to *b* represents the trans-trochanteric line; from *c* to *d* represents the trans-spinous line; from *e* to *f* in the illustration is two and three-quarter inches, and from *g* to *h* is one and one-half inches, showing that there

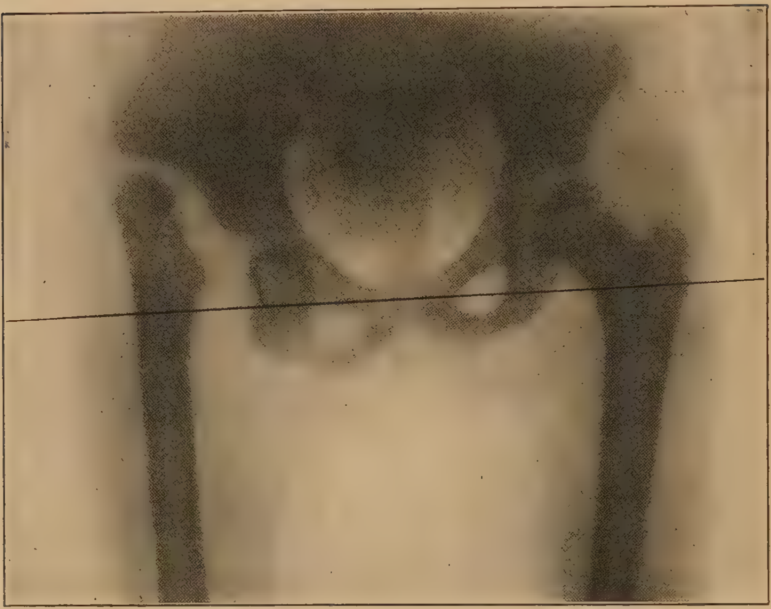

Fig. 5.—Old Cured Tubercular Hip. Transpubic Line Bisects Normal Trochanteric Eminence, but the Trochanter is Two Inches Above on the Diseased Side.

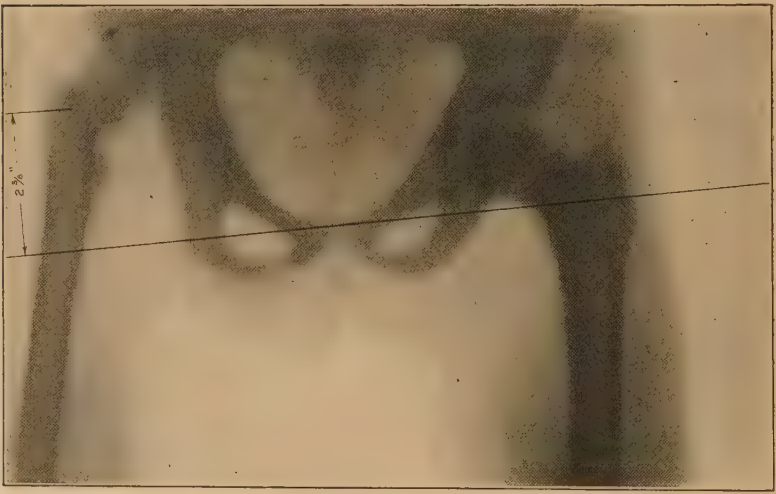

Fig. 6.—Congenital Dislocation. Trochanter on Diseased Side Two and Five-eighths Inches Above Transpubic Line and almost as High as the Trans-spinous Line.

is a displacement upward or shortening on the right side of one and one-fourth inches. (See Figs. 2 and 3.)

I do not think it necessary to report individual cases further than to say that this method has been in use for some time and in every instance radiograms and other methods of measurement have confirmed this very rapid and simple plan. It must recommend itself to all because of its simplicity and because no appliances are required other than those found in the most humble home.

III.

THREE CASES OF DOUBLE HIP DISLOCATION, SUPPLEMENTED BY A REPORT OF SEVEN CASES OPERATED ON BY PROFESSOR LORENZ.

A. J. STEELE, ST. LOUIS, MO.

The case selected by Professor Lorenz to illustrate the characteristic gait, carriage and deformity attendant upon double congenital dislocation of the hip, at his public clinic held in St. Louis, November 21, 1902, was K. S., age six years and eight months, a strong, rosy-cheeked girl from the plains of the southwest. As she walked around the arena it appeared indeed a truly typical case. Much to my surprise and disappointment the professor did not select her for operation. Later he remarked to me that as the hips were so high, and she so muscular and of such age, that it would not be an ideal case for a public clinic. Great, too, was the disappointment of the parents, who, attracted by the reputation of the distinguished foreign specialist, had brought their daughter a thousand miles to have him cure her. I sympathized with these people and, at their urgent request, signified a willingness to undertake the case myself, though with some misgivings as to the result, since our experienced confrère had so summarily turned the case down. (Fig. 1.)

After six weeks' strong traction, and additionally repeated free division of the adductors, the operation was successfully performed, I being assisted by Doctors Allison, Hall and Jones, all of whom were more or less familiar with the Lorenz method. In addition to the usual classic manipulations we employed powerful screw traction to each limb. Four months later, the limbs meanwhile having been held in right-angled abduction with slight hyperextension, the plaster splint was removed for inspection of the parts. The limbs were brought down a little

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and a double spica reapplied. This second dressing was removed after having been retained three months. A skiagraph showed the relation of the heads to the sockets as satisfactory. (Fig. 2.)

The after-treatment was long, tedious and painful, as the patient was, and continued to be, hypersensitive. The left hip seemed to be in perfect reposition, the right head slightly anterior with external rotation—probably due to a slight twisting of the neck. The abduction of the thighs and the flexion of the knees were difficult to correct.

To-day (now more than a year since the operation), so far as can be determined by appearances, by manipulation, by locomotion and by the X-ray, the reduction is anatomically and functionally perfect; and with a daily improvement in gait and carriage. Recently she has left us for her far distant home, practically cured. (Fig. 3.)

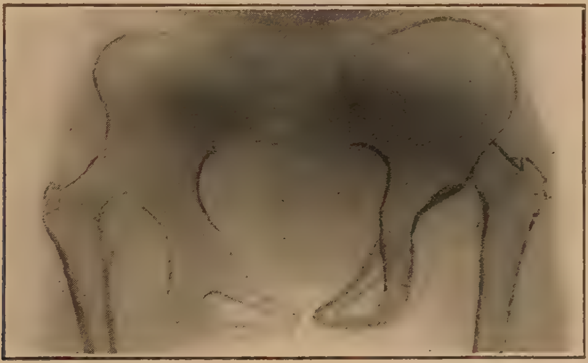

Fig. 1.

This case illustrates the advisability of preliminary treatment in the less hopeful cases of congenital hips. Six weeks' stretching of the muscles by the application of eight to ten pounds' traction to each limb, in conjunction with a repeated tenotomy of the adductors, rendered possible what otherwise would have resulted simply in an anterior or other transposition or possibly been attended with serious lesion of bone or nerve from the extreme force that necessarily would have been used. Even as it was, there resulted in this case a paresis of the right peroneal nerve, causing foot drop, which, however, has not remained permanent.

The patient had, to a marked degree, the nervous shock, irritability and hyperesthesia, which condition seems almost to be an appanage to this operation, not only immediately following the manipulations of reduction, but also the necessary manipulations after the removal of the spica. Thus the after-treatment was tedious and imperfect on account of the pain attending it. Tying the knees together to correct the abduction, and traction to the legs to straighten the flexed knees were accessory aids. The nervous excitation caused no little loss of flesh, which however, has returned with the discontinuance of the massage and the indulgence in out-of-door activity and life.

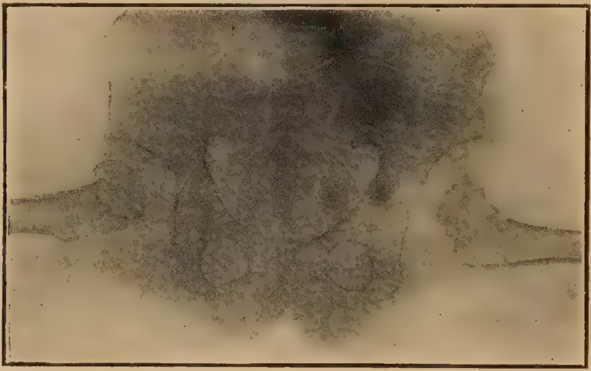

FIG. 2.

The second case came under our observation September 25, 1903. M. D., female, age eight years. The diagnosis of double congenital hip dislocation was verified by the X-ray. This condition of the hip was obscure from the fact that no gliding motion was possible. The stability of the false joints, with the elevation of the trochanters, and the marked adduction of both thighs, suggested coxa vara. However, the extreme lordosis sufficiently characterized the case as one of displacement. The skiagraphic picture indicated well-formed sockets on the dorsum ilii—buttresses of bone thrown out around the heads. (Fig. 4.) On this account, and considering the age of the patient it was not thought wise to attempt reduction, only to overcome the marked adduction present. This was partially accomplished by division of the adductors and putting up the limbs strongly abducted. In three weeks' time the operation was repeated, and though some improvement followed, yet the results were not satisfactory; therefore, to give new direction to the thigh bones, by division of the same, seemed a reasonable proposition. So a double Gant operation was performed, and the limbs put up in 45° abduction. Removal of the double spica at the end of four weeks showed nonunion. Nothing then remained but to freshen and wire the fractured ends. This was done and the bones promptly united. To-day our patient is walking, much improved as regards the adduction. And yet, doubtless, our procedures to overcome the adduction were too radical. We should have been content with tenotomies and abduction in the plaster spicas.

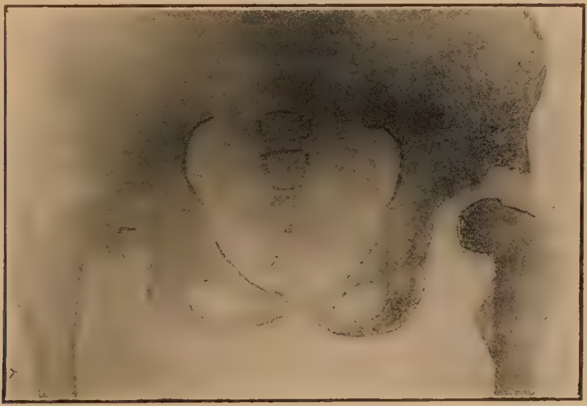

FIG. 3.

The nonunion following the double Gant operation was due to the fact that the osteotomy cuts were made too low—too far down on the shafts. The elevation of the thigh bones misled us as to the proper point for section. Again, after section the lower fragments were carried out too far, thus disturbing accurate apposition of the fragments.

Though, after wiring, the bones became firmly united, and with improvement in the position of the limbs, and in the gait, yet I should hesitate before repeating the bone section in a similar case.

A skiagraph taken at this time showed the wire still *in situ* on one side only. On the opposite side its removal had been made possible by the use of a device suggested by Dr. A. H. Meisenbach, of St. Louis, consisting of a piece of solid metal, in dimensions about one-fourth inch by one inch and in height the distance from the bone to the level of the integument, designated by him "the bridge," over which the ends of the wire were twisted. The edges of the wound were united as usual up to this point. After two weeks the wire, easily accessible, was divided and readily removed. If, for any reason, a surgeon prefers his wire out, it having served its purpose, this little trick is well worth knowing.

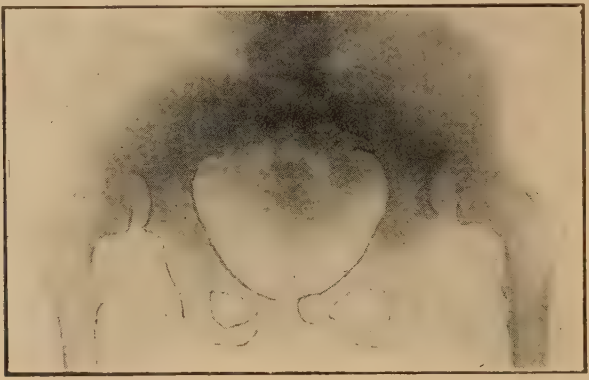

Fig. 4.

This case is especially noteworthy because of the stable false joints already formed on the dorsum ilii. This obscured the diagnosis, but the X-ray settled the matter beyond doubt—an illustration of its worth.

It so chanced that an orthopedic surgeon, who claimed to have enjoyed great opportunities abroad in the study of congenital hips, examined this case previous to the treatment being instituted, and gave us, with much assurance, his opinion that it was a case of rare double coxa vara. But his countenance fell when the skiagraphic picture was shown him. He gracefully acknowledged his error, and begged a copy of the print.

The third case came under observation March 10, 1904. Unlike the two preceding it was an adult female, Mrs. F., age forty-three years, both hips out, heads resting on the dorsum. The right hip had been displaced three years and the left hip two years previously, without traumatism. There was no history of convulsions or spasms, and, if the statement of the patient can be believed, there had been no evidence of local disease so far as pain or impairment of motion were concerned. Systematic efforts at reduction had never been made.

She is a hard-working woman; had given birth to ten children; the last confinement four years ago, with twins; she is yet to experience her menopause; she was always up soon after her confinements without in any case experiencing looseness of the interpubic or sacroiliac joints. Manipulation readily reduces the heads but a slight cause throws them out again. With much difficulty she gets about on crutches.

In the way of relief I have made a strong leather skirting girdle, shaped over a cast of the part, a firm pelvic band with pads attached on the inner sides, pressing downward and inward on the trochanters, with counterpressure by perineal straps bearing on the tubers ischii, the idea being that after reduction of the hips the application of the belt would press the heads firmly into their sockets and thus largely throw the weight of the body on the perineum. Whether or not this apparatus will be permanently successful remains to be seen.

I am not prepared to say just what pathologic condition so impaired the heads and sockets as to permit of such easy displacement. But I present the case more especially with the hope of receiving suggestions as to the most efficient therapeutic measures to be employed for its relief.

Some years ago I succeeded, by long-continued traction, in reducing the congenitally displaced hips of a very young girl, and of retaining them by a pelvic girdle, such as already described, and had not a too sympathetic and too officious grandmother removed the apparatus the girl, now a young woman, would to-day, I believe, be walking without a waddle.

Would it be possible to produce, in the case of this woman, an arthrodesis on one side, by passing a red-hot iron into the joint and pinning the bones to either? Or could the head be removed and the stump placed into the socket and again pinned? I regret that the X-ray picture was too obscure to show light on the condition of the joints.

As, at this meeting, we are having something of a symposium on congenital hips, I may be allowed briefly to refer to the results of the Lorenz hip cases operated on in St. Louis. This was on November 21, 22, 1902, at the Polyclinic. I will refer to the cases alphabetically. Seven in all; ten hips; all females; three double; four single.

Case 1.—C. A., age eleven years, single, left. The spica was removed in five and one-half months and replaced by one with less abduction, the child being exceedingly sensitive. The plaster was permanently removed in the eighth month. The head was found displaced anterior and forward, and the thigh fixed in abduction. Massage and efforts to bring the limb down were ordered. S. P., this present date, June 7, 1904: Thigh fixed in abduction of 65°, femoral head well forward, gait extremely awkward though wearing one and one-half inches of cork under sound limb. Parents quite heart-broken.

Case 2.—E. B., age seven years, single, right. I have not seen the case since the operation, as it soon after left the city. The father writes that the plaster cast was removed in the eighth month, and that at present the thigh is still abducted and the knee slightly flexed, but that "she is a great romp and skips the rope."

Case 3.—M. K., age four years and ten months, double. The plaster spica was removed in the seventh month by one of my assistants, who reported that apparently the heads were in their sockets. She received no professional after-treatment. A few months later on my return from Europe I saw the case and found the condition as shown in the skiagraphic print (Fig. 5), one head on the dorsum, showing that if it had been reduced a relapse occurred, the other head transposed anteriorly and thigh abducted. The print seems to indicate that the trochanter major is in the socket. There is an improvement as regards the lordosis. Unfortunately the parents will not allow further operation.

CASE 4.—McL., age four years, single. I have not seen the case since the operation, as shortly after it left the city. I gather from what the father writes that the spica was removed in the eighth month, no special after-treatment, and that at present there is an anterior transposition.

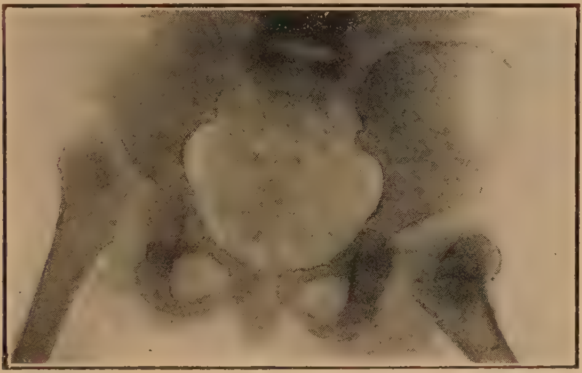

FIG. 5.

CASE 5.—M. S., age eight years, double. Spica removed in the seventh month and the after-treatment conducted intelligently under the direction of Dr. Mueller. The father reports child doing well, but Dr. Mueller tells me, since coming to this meeting, that the result is not a perfect anatomic reposition.

CASE 6.—C. P., age three and one-half years, double. Much pain, swelling and ecchymosis followed the operation; improved after three weeks' time. The double spica was removed in the seventh month. For after-treatment the case fell into the experienced hands of Dr. Mueller. S. P., June, 1904: I find one head transposed forward, and the other one on the dorsum ilii. Parents greatly incensed over the result.

CASE 7.—M. S., age eleven years, single, left. In five and one-half months the spica was replaced by one of less angle, and the second one was removed three months later. The usual extreme sensitiveness was present. No special after-treatment. S. P., June, 1904: Anterior displacement, abduction of limb and awkward gait. Disappointment of parents great.

Summary.—Of the ten hips operated on six have anterior replacement, two are in the dorsal position, and two (same patient) "not in anatomic reposition" (Dr. Mueller). Altogether a poor showing. Whether or not the anterior replacements will improve in functional use remains to be seen. If it is possible that the after-treatment of these cases was not correct, then it was the fault largely of the operator in not leaving definite instructions as to what it should have been: what he desired it to be. I do believe that in one case, at least, the head was in the socket on removal of the plaster and that it was permitted to slip out again.

IV.

SACRO-ILIAC DISEASE IN A YOUNG CHILD.

A. THORNDIKE, BOSTON.

The comparative rarity of this affection in babies and young children, together with the difficulties that often beset its recognition in early life, have inclined me to make this report. Most writers have alluded to the comparative immunity of children from sacro-iliac disease, but the explanation offered by the late Prof. L. A. Sayre is still unchallenged: that it usually follows a severe accident and that the little ones are more carefully safeguarded. Van Horn in 1890 knew of only six children under ten years of age out of 72 cases of tubercular disease of this joint.

Jos. M. was admitted to the Children's Hospital March 23, 1904. In July, 1902, was sixteen months old when he fell from a rocking chair to the floor, striking on his left side. After a fretful night he seemed all right for a month, when an abscess appeared, pointing just to the left of anus. It discharged for six weeks under poultices, closed, and remained healed fourteen months. For the past three months it has been running off and on, but did not discharge during his stay in hospital. His mother thinks abdomen has been enlarged ever since his fall. The bowels have been constipated, but are now regular; for two weeks his attempts to urinate have been often ineffectual and frequent and the color of water said to be dark; and the eyelids are said to have been puffy.

The boy is well developed, rather thin and pallor noted of face, mucous membranes and nails. Examination of heart and lungs negative; abdomen soft and tympanitic except in the left half, where a mass, the size of a large orange, can be felt extruding from border of ribs to rim of pelvis. It is rather soft, of smooth, uniform, rounded shape; does not move under the hand and does not adhere to the skin. Over the left buttock is a round, slightly raised area the size of a silver dollar, not reddened, which gives the feeling of deep fluctuation and

Presented at the Eighteenth Annual Meeting of the Association, at Atlantic City, N. J., June 8–10, 1904.

on pressure gives a click, which can also be produced by moving the thigh in abduction. The click can be heard as well as felt; it is not painful or tender. Walks with a limp which is a well-marked favoring of the left foot. Motions of knees and hips are not impaired. No muscular spasm in thigh. Slight rigidity of lumbar spine. Boy evidently objects to examination of spine and hip. The diagnosis lay between sarcoma of the left kidney with metastatic growth in the ilium and a large abscess no longer confined by the fascia of the iliacus muscle making its way out posteriorly. I advocated the former view because of the supposed urinary symptoms and the click, which suggested crepitus of a fracture, thinking that the ilium had been weakened by the sarcoma and that the posterior superior spine had become broken off. Dr. H. L. Burrell, who kindly came in consultation, thought the chances were in favor of an abscess and advised exploration; to drain if it were; otherwise to verify by microscopic examination of a small bit of the tumor. If sarcoma the case was plainly inoperable. On the morning of March 26 I made a vertical incision three and one-half inches long over the mass on the left buttock, coming through the deep fascia on to inflammatory tissue enclosing the completely disorganized sacro-iliac joint. Three loose sequestra the size of a fifty-cent piece were removed; likewise several smaller bits of bone, and considerable softened, denuded bone was curetted away from the ilium and sacrum. When pressure was made on the abdomen pus welled up from the depth of the wound. The opening was enlarged and about a pint of pus evacuated; a large sized rubber drainage tube was inserted with gauze wicks and gauze dressing. The condition was poor; both pulse and color were bad. He made a good recovery from ether and shock. The dressing was changed on the second and fourth days, when the tube and wicks were also changed. After this the drainage failed and although it was reestablished under ether it continued to be difficult to drain so large a cavity through so narrow a sinus. The present condition, two months after operation, is as follows: He is walking with a slight limp and still has a small sinus about three-fourths inch deep near middle of scar. There may be some carious bone at the bottom, but I fail to find it by probing. I cannot obtain any movement between the ilium and sacrum; the abdominal swelling has disappeared; there has been no lighting up of the old sinus near the anus. Examination by Dr. Low of a bit of the abscess wall removed at operation showed many giant cells in a tissue resembling granulation tissue. Several of the giant cells contained tubercle bacilli. One of the sequestra was decalcified and sectioned; cover-glass smears of pus showed tubercle bacilli and swabs failed to grow on serum. The pathologist's report gave no evidence of the process being anything but a tubercular one.

Here we have an extensive joint disorganization with necrosis, due to bone-tuberculosis, probably beginning after trauma at the age of sixteen months, manifesting itself a month later by an abscess pointing a short distance to the left of the anus. After discharging six weeks and remaining healed over a year, it reappears and discharges from the old sinus three months, while a large abscess cavity accumulated in the iliac fossa and retroperitoneally, with the complete destruction of the joint and separation of sequestra.

A somewhat different picture is given by Van Hook, of Chicago, who relates a case of the late Prof. L. A. Sayre, of New York: A child of two and half years fell behind a trunk and soon after had a lumbar abscess, which was drained three times by eminent surgeons, but which always refilled. Sayre found the child a year after the accident in a critically septic condition and removed considerable carious bone from the joint. The patient grew up to be a strong man and died of an accident at the age of thirty-two.

These cases represent different phases of pure sacro-iliac disease and illustrate three different routes of pus burrowing, the ischio-rectal, the iliac fossa and the lumbar. They also illustrate the great tolerance of little children for destructive ostitis in this region, with large abscesses, which had existed in both cases over a year. Sacro-iliac disease in early childhood may also accompany or coincide with caries of the lumbar spine:

Lilly L. came to the out-patient department in May, 1903, and was treated with plaster jackets for lumbar caries until January, when motion, crepitus and a lumbar abscess were discovered and she was admitted for operation. She had been uncomfortable in her jackets and acutely sensitive whenever they were changed; repeated jackets failed to improve this; in fact, she became worse as time went on. Dr. John Dane operated and I am indebted to him for the privilege of reporting it. There was not only a lumbar abscess but necrosis of the left ilium into the joint, of the upper part of the sacrum, involving part of the other sacro-iliac synchondrosis and of the three lower lumbar vertebras, which were almost entirely removed. Despite this the child has been gaining of late and although she still suppurates she is far more comfortable than she was in her plaster jackets.

A conspicuous feature of these cases is the element of bone necrosis and the formation of sequestra, in one case in the ilium and sacrum, in the other involving both sacro-iliac joints and almost all of the lumbar vertebras.

Whether or not this is a characteristic of tubercular bone disease in early life I know not; it certainly occurred after more than a year's neglect of the sacro-iliac disease.

DISCUSSION.

Dr. Shaffer said that he had been much interested in the paper because he had frequently seen cases where a diagnosis of sacro-iliac disease had been made when the disease was not so located. Dr. Thorndike had pointed out the difficulties of diagnosis. The differential diagnosis between sacro-iliac disease and disease between the last lumbar vertebra and the sacrum was difficult. Eminent surgeons have made this mistake, as shown by the post-mortem findings which showed the disease between the last lumbar vertebra and the sacrum.

V.

ON THE MEANS OF LENGTHENING, IN THE LOWER LIMBS, THE MUSCLES AND TISSUES WHICH ARE SHORTENED THROUGH DEFORMITY.

PROF. DR. A. CODIVILLA, BOLOGNA, ITALY.

The difficulties to be encountered in lengthening a shortened limb, are found, in operation, to be greater as regards the fleshy parts, than as regards the bones. It is comparatively easy to remove the splinters of a fractured bone which is wrongly consolidated; to separate a curved bone; or to perform an oblique osteotomy, but a decided limit is arrived at in the correction of a displacement, or in the lengthening of the bones, by reason of the contraction, or resistance, of the muscles. Our supreme consideration must therefore be given in striving to overcome this resistance on the part of the muscles, without however damaging in any way the action of the tissues. This is the special subject on which I desire to enlarge, as it appears to me that this important part in the cure of deformity of the limbs, has never been sufficiently taken into consideration.

As things stand at present, we trust to empiric measures to overcome this contraction of the muscles, whereas in reality mathematical precision should be used, in each special case.

But for this mathematical precision, we are still in want of a scientific basis. We are in fact, without the requisite knowledge as to how the normal muscles and other tissues act, when subjected to forced distention; as to how great an extent they are capable of being lengthened, without their physiologic action being altered; as to the method, in lengthening, which may be best adapted to them; as to the action, while subjected to distention of those tissues which have become shortened through the separation of the bone which kept them in place; as to

Presented by title at the Eighteenth Annual Meeting of the Association, at Atlantic City, N. J., June 8–10, 1904.

their loss in elasticity, when time has elapsed since their shortening, and as to many other questions, which I omit, for the sake of brevity.

In consulting works on the subject, we find that surgeons have adopted very diverse courses in cases of lengthening the fleshy parts, where there is shortening of the limbs. The greater number have applied constant traction, after having separated the bone; others have used great stretching, under narcotics, followed by constant extension of the muscles, by means of weights; others again, after the stretching, have applied the plaster apparatus. A very notable difference exists also as

FIG. 1.—FRACTURE OF THE LEFT FEMUR AT THE MIDDLE PART.

regards the degree of force which has been applied with the weights, ranging from a small, to a high number of kilogrammes, without a proportionate difference existing in the condition of the resistance of the muscles, in relative cases.

The treatment by the surgeon of these cases has been determined rather by matter of habit, than by the exigencies required, as scientifically proved, in each individual case, and each operator has had recourse, for instance, either to the plaster apparatus, or to continued traction, according to his opinion as to which of these usual methods is best, in the treatment

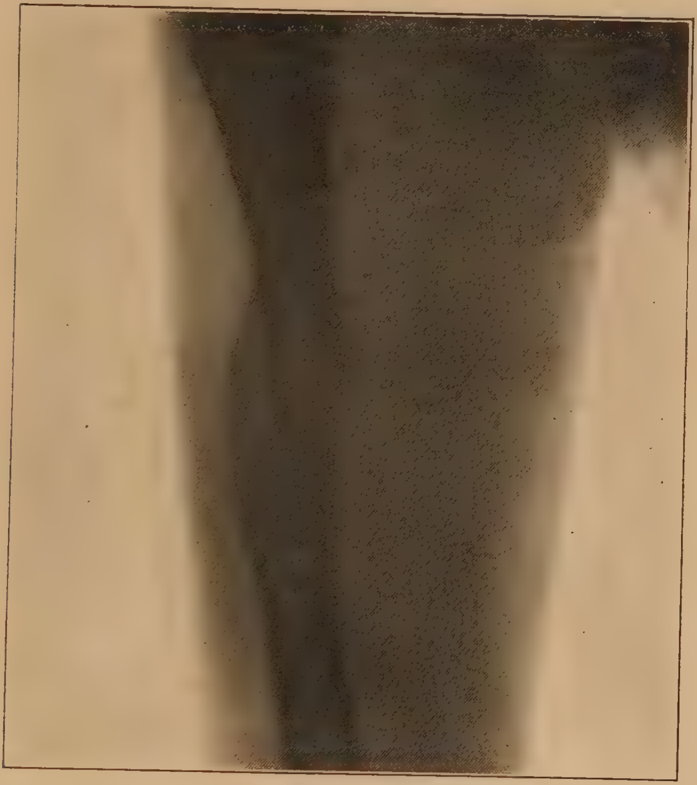

Fig. 2.—Oblique Osteotomy on Neck of the Fracture.
Same case as Fig. 1.

of recent fractures; and for the same reason he has applied either light or heavy weights.

It is now time that we should earnestly endeavor to free ourselves from blind and empiric custom, and discover the means of lengthening the tissues to their greatest possible extent, while compatible with the maintenance of their physiologic functions. The solution of the questions on which I have already partly touched, and which gives us a scientific basis from which to resolve the problem, can be arrived at by experiments on animals, and by clinical observation.

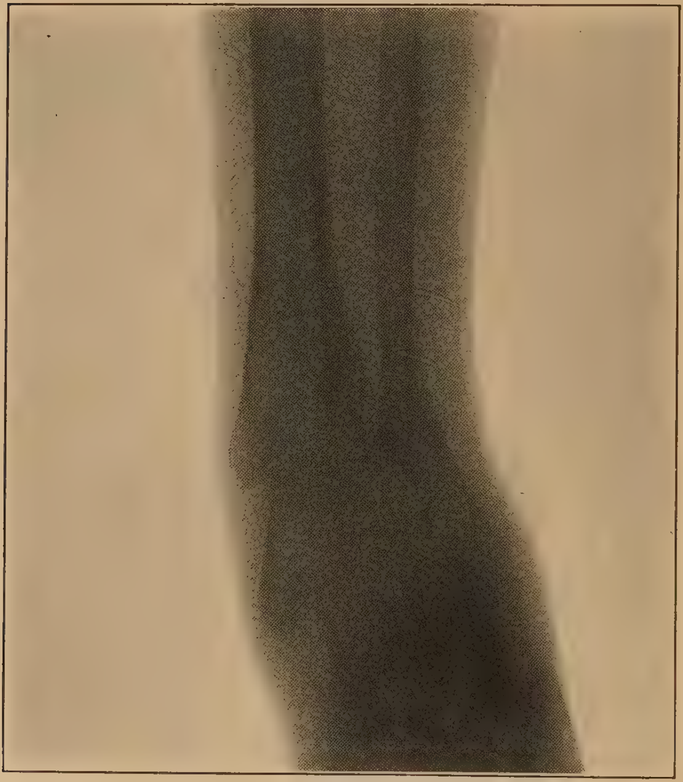

Fig. 3.—Deformity from Fracture of the Third Lower Part of Leg.

Now, given that we acquire exact knowledge as to the action of the muscles and tissues when subjected to tensive force, without the alteration in any way of their physiologic functions, it will be possible for us to determine approximately what may be the degree of force necessary for extending the fleshy parts to their maximum extent on a given portion of limb, without injuring their functions. In dealing therefore with the case of a shortened limb, we must first determine what lengthening may be necessary in order that it may regain its normal size. This may be proved mathematically.*

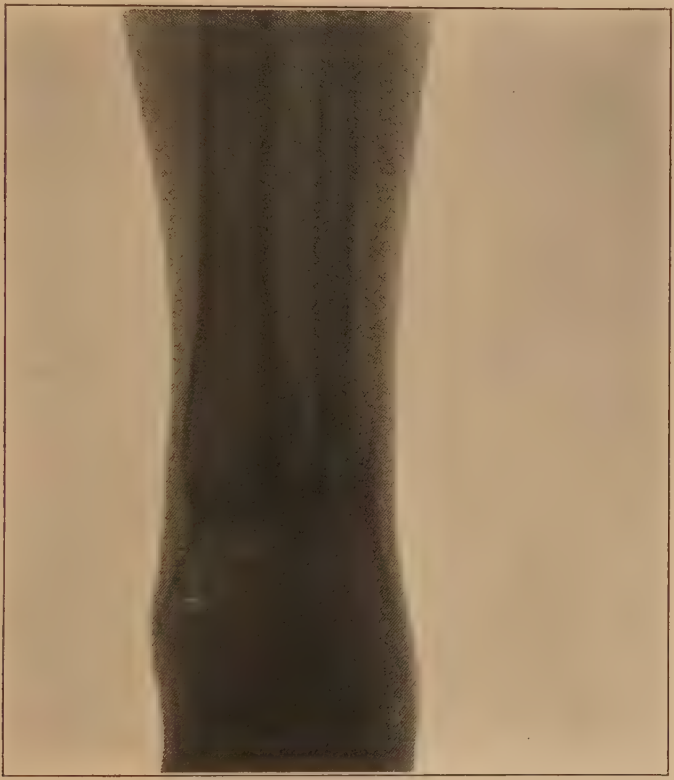

Fig. 4.—Deformity from Fracture of the Third Lower Part of Leg. Same case as Fig. 3.

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*See *Archivio di Ortopedia*, fascicolo 3°, 1904.

When once we shall have mastered this point, we will be in a position to decide as to the degree to which the limb is capable of being lengthened, and to determine what force is necessary for the corresponding extension of the fleshy parts.

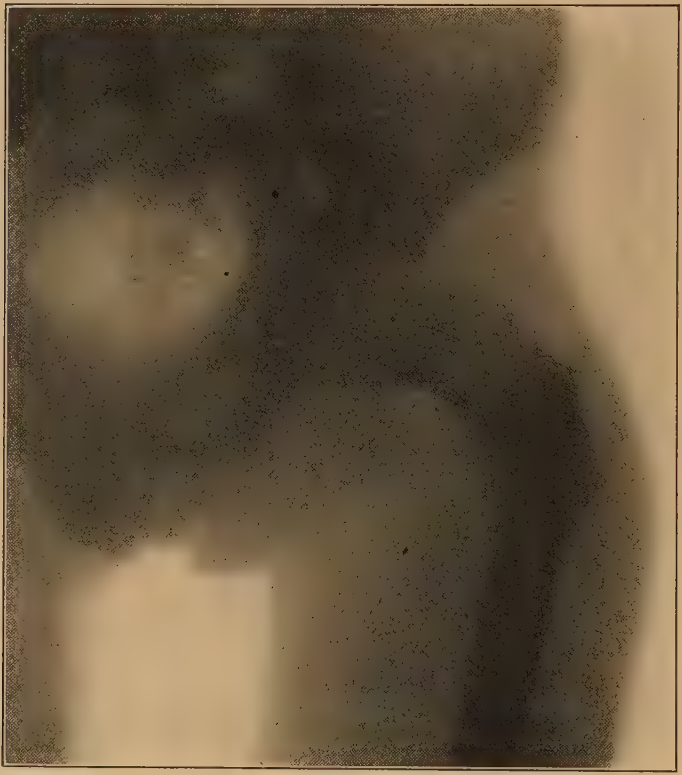

FIG. 5.—DEFORMITY FROM FRACTURE AT THE THIRD UPPER PART OF THE RIGHT FEMUR.

Even admitting that we possessed the knowledge which at present we have not, practically, we could not solve the problem with mathematical accuracy, on account of the many intricacies which surround it, but we might at any rate arrive at some conclusion, which would serve to guide us, and help us to emerge from the darkness and uncertainty in which we at present are.

Until now the want has not been felt, of solving this problem precisely, because, while at the same time desiring to determine the degree of force required, there were many other things to be considered, besides the question of the resistance of the muscles, and of their action when subjected to tension. In fact, the force which was transmitted to the bones through the medium of the skin, and other soft tissues with which they are covered, was greatly lost in attritus, and through other resistance, whilst a considerable amount of force also did not

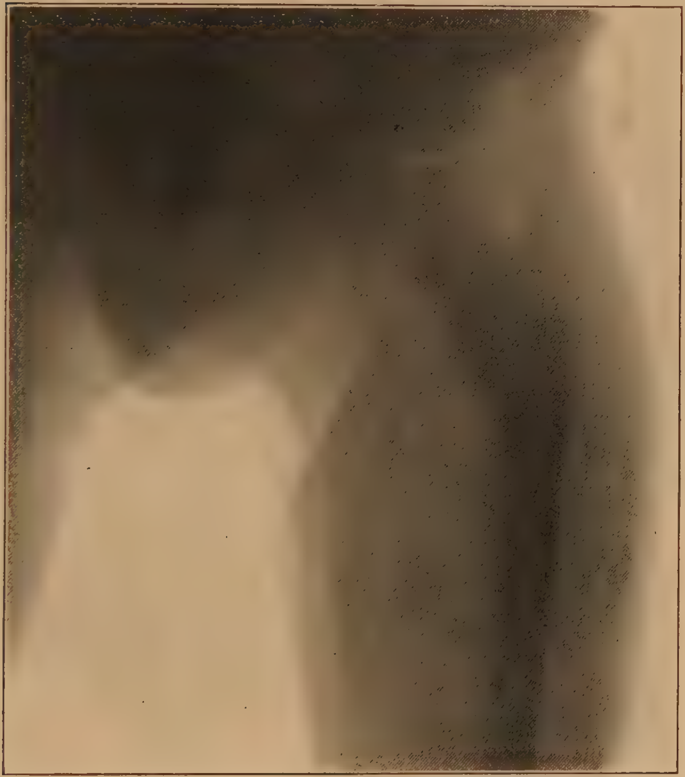

FIG. 6.—OSTEOTOMY AND TRACTION (NAIL IN THE HEEL).
Limb augmented eight centimeters in seventeen days.
Same case as Fig. 5.

reach the skeleton, being eliminated in the attritus developed by the lying of the limb on the plane of support.

Then again there is a great limitation in the degree of tensive force which may be applied to a limb, by reason of the inability, on the part of the patient, to bear, beyond a certain limit, the pain proceeding from the drawn or compressed skin. This has not even been taken into consideration in determining what force is necessary for the extension of the tissues, to their maximum length, while compatible with the maintenance of their normal functions, which constitutes the rational limit to the intensity of the force which may be applied. Now in order that we may be enabled to proceed, in an ideal way, toward the desired extension of the fleshy parts, it is necessary to remove all the causes, which, without justification, limit, or waste, the force, physiologically possible to be applied.

I am of the opinion that an important step in this direction has been gained by my method of applying the force directly to the skeleton.

Before however speaking of this, I must mention that by experience gained through modern methods in the cure of deformity—especially of congenital dislocation of the hip—I am convinced that in so far as regards the extension of the fleshy parts, and when great force is necessary, the best results are obtained from forced lengthening, practised under narcotics; by using a sudden and intense force; and by then applying the plaster apparatus to the limb while it is still maintained in complete extension.

I therefore hold that preference should be given to this method.

But in cases of great shortening, or where the resistance is conspicuous, I believe it would be dangerous to actually operate with a tension which is extraordinarily great, in order to obtain an immediate lengthening of the tissues, sufficient to remedy the shortness of the limb.

There is also danger by excessive extension of the soft tissues, from the reaction which occurs in the central nervous system; a reaction which shows itself, according to my experience, in convulsive attacks, which commence after a lapse of time (two or three days), from the period at which the force was first applied, and which may become so serious as almost to constitute a state of epilepsy, and which necessitate the cessation of the traction.

In these cases, therefore, instead of applying a too powerful traction, it is better to proceed to the act of lengthening by stages, followed by the application of a traction of medium intensity (not exceeding 25 or 30 kilograms). This mode of extension by stages, removes the inconveniences which arise from excessive traction, and enables us to overcome the resistance, by means of a proportionately lesser force; because in its every fresh application there is a decided gain in the extension of the fleshy parts, to which the elasticity of the tissues in a certain way is adapted. The following was first the method of technical application:

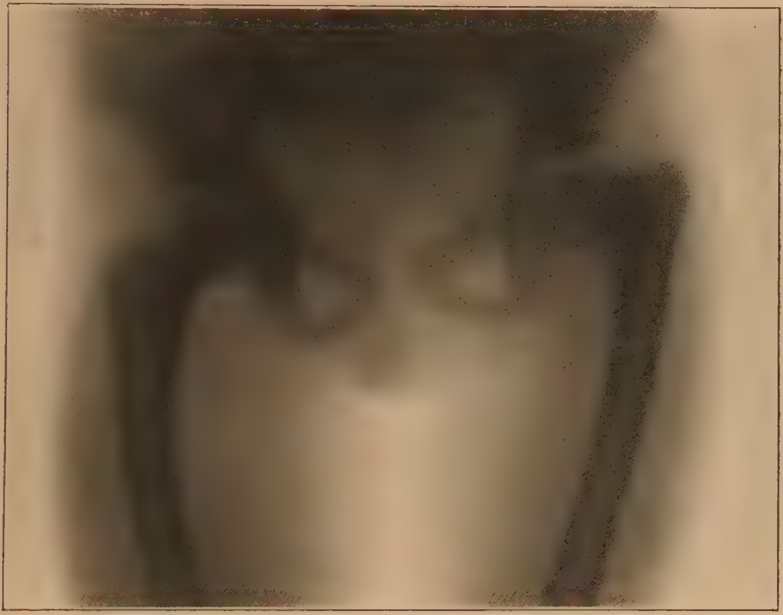

FIG. 7.—DEFORMITY FROM COXA VARA.

Having, if necessary, performed the osteotomy, and removed the splinters, etc., and in a word executed the operation which removes the resistance offered by the bones to the process of extension, the patient was placed on a Schede-Eschbaum bed, and the limb was subjected to traction, and to counter-traction. The force adopted ranged from 25 to 75 kilograms.

Under the action of this force, the fleshy parts were extended, while a plaster apparatus was applied, which encircled the pelvis, and reached to the foot, which it enclosed. In order that the traction should not be interrupted during the time in which the plaster apparatus was being prepared, some days before the operation was performed a plaster bandage was applied, which covered the foot, and the lower half of the leg.

FIG. 8.—DEFORMITY FROM COXA VARA AFTER OPERATION.
See Fig. 7.

The traction was thus applied above the plaster apparatus which covered the foot, whilst the plastering, without interrupting the traction, was completed in that part which had to enclose the rest of the limb, and the pelvis. When the apparatus was solidified, the traction was withdrawn, and the force continued to act upon the limb by means of the detracting action of the said apparatus.

After a few days' time a new detracting force was applied, in the following manner:

The plaster apparatus was cut circularly, by means of a saw (*filo sego di Gigli*), so as to correspond with the division of the bone, and the traction and counter-traction were directly applied, respectively to both the nearest and the farthest portions of the plaster apparatus. These were thus separated the one from the other, and the limb was lengthened correspondingly.

With this fresh application of the traction, the soft parts underwent a further lengthening, and in the same manner in which the first application of the force had been made, the detracting action was left to the apparatus, so soon as this had been completed. Thus the space left empty by the separation of the two parts, was filled up by a few windings of the bandage round the limb.

The application of the force could then be repeated as many times as was considered necessary, either under narcotics, or without, according to the needs of the case.

But the method of application in this manner, which I applied in my first cases, gives rise to inconveniences.

I have already spoken of the general derangement of the nervous system, which followed, when the traction had been very intense (50 to 75 kilograms).

But there was another complication which it was impossible to remedy, without modifying the technic of the method. This was that the compression used upon the instep, upon the ankle, and upon the heel, led to necrosis of a large surface of the skin, and of the tissues (including the tendons), which lie between it and the bones.

These places are those in fact, upon which the force acts with the greatest intensity, because the lengthening of the limb is maintained by the resistance which the apparatus offers to the foot, which has a tendency to draw up, under the tensive action of the soft parts.

This applies so far, to the traction. The counter-traction on the other hand when applied to the base of the limb, has at its disposition a larger surface to rest on, and upon those parts of the bones which are (with the exception of the ischion), very well protected by the covering formed by the fleshy parts. And for these reasons the pressure exercised by the apparatus upon the base of the limb is without the grave consequences it has, when applied to the foot.

Thus it was possible to continue the application of the counter-traction in the same manner, while with regard to the traction, it was necessary to find the means of permanently removing the dangers of necrosis, which followed seriously upon the compressing action of the apparatus, however great the care which had been taken in applying it. To gain this end it seemed to me necessary to transmit the force to the skeleton, thus excluding the skin, and the other soft tissues of the foot, and to arrive directly at the bones.

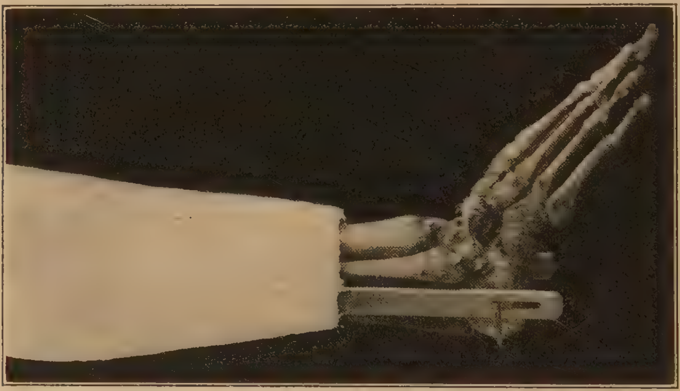

Fig. 9.—A photograph, in which is represented the lower part of the apparatus, composed of the ferrules and of the nail.

I have obtained this direct transmission of the force to the skeleton, by means of a large nail being passed through the back part of the heel; a nail, which by means of two lateral ferrules, fixed in the plaster apparatus, is held in the desired position.

The diagram shows better than any description can do, the position of the nail with regard to the skeleton, and to the apparatus.

Experience has demonstrated that the traction transmitted to the skeleton by means of the nail passing through the heel, does not present any inconveniences, and fulfils the desired effect. There have been a great many cases in which both by me, and by others, this method of traction has been put to the proof.

The nail, even if it be of the thickness of 5 or 6 mm. in diameter, is easily passed through the bone, without fracturing it; and is well borne by the tissues, even during a long period of time (thirty to thirty-five days, though on an average it has been applied for about twenty days). It does not produce any ill effects upon the bone (decubitus) worthy of note; it does not cause any painful sensations to the patients; permitting them movements in the tibio-tarsal articulation, and in the other articulations of the foot.

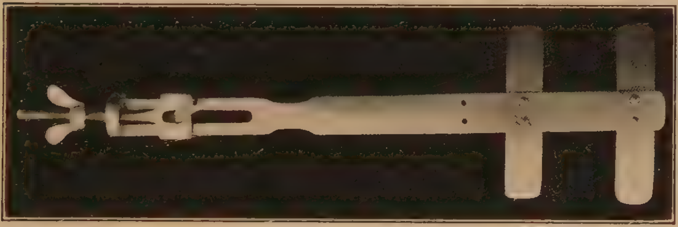

Fig. 10.—A photograph which shows the ferrule in detail in its union with the nail. The screw is to serve only for diminishing, and not for augmenting, the traction, in cases in which for some complication it may be found necessary.

By reason of the position which it occupies between the longitudinal axis of the tibia, and that of the tricipite surale, it maintains the foot in an intermediary state between flexion and extension, and does not in any way injure its function.

The method thus modified, renders possible a far stronger application of the traction, than has ever yet been obtained, and permits the lengthening of the fleshy parts of a shortened limb, without its giving us any anxiety and without other limitation in the application of the force, save only for the harm which it might cause to the physiologic functions of the tissues to be lengthened.

By this method we have obtained in all cases the constant fulfilment of our desires, *viz.:* the important lengthening of from 3 to 8 cm., which, I believe I can well affirm, could not have been arrived at by other means.

I insist upon demonstrating the complete harmlessness of the application of the nail, in the manner indicated, and of the ease with which it is borne by patients. Thus being myself quite convinced as to the efficacy of the method of traction which I recommend, I should greatly regret the hindering of its being put to the proof, by reason of any preconceived ideas on the subject, which at the first moment may arise.

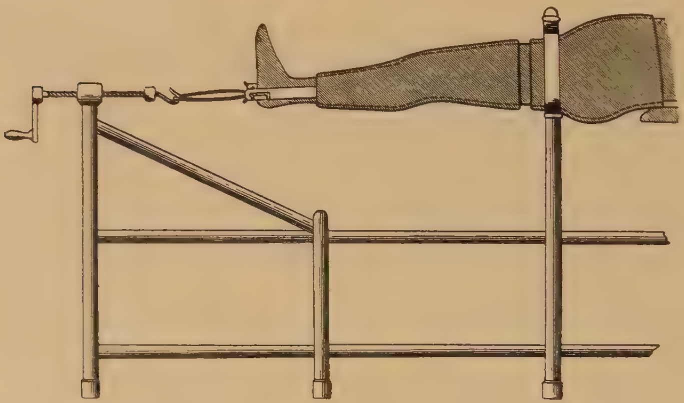

FIG. 11.—A diagram which shows the whole apparatus at work, while the traction and the counter-traction are applied to the two portions of the plaster apparatus.

I mention some cases which I have cured by the foregoing means and show some radiographs and photographs.

The cases in which I applied the method, including 8 cases operated on by Dr. Rossi and Professor Galeazzi, were 26, of which

11 were old fractures of the femur, healed with deformity, and with notable shortening; coxa-vara (congenital, due to rickets, and deformity from youth), cured by my process of osteotomy *a cerniera* (turning-joint) and traction on the nail; 5 cases of shortening from other causes, stoppage of growth, dislocation after typhus, rickety curvature, etc.; 3 old fractures of the leg, 1 pseudo-arthrosis on the upper third of the leg with notable displacement of the fragments; 2 fractures above the ankle, with serious lateral deviations. In these cases of fracture of the leg, the traction on the nail was applied at the same time

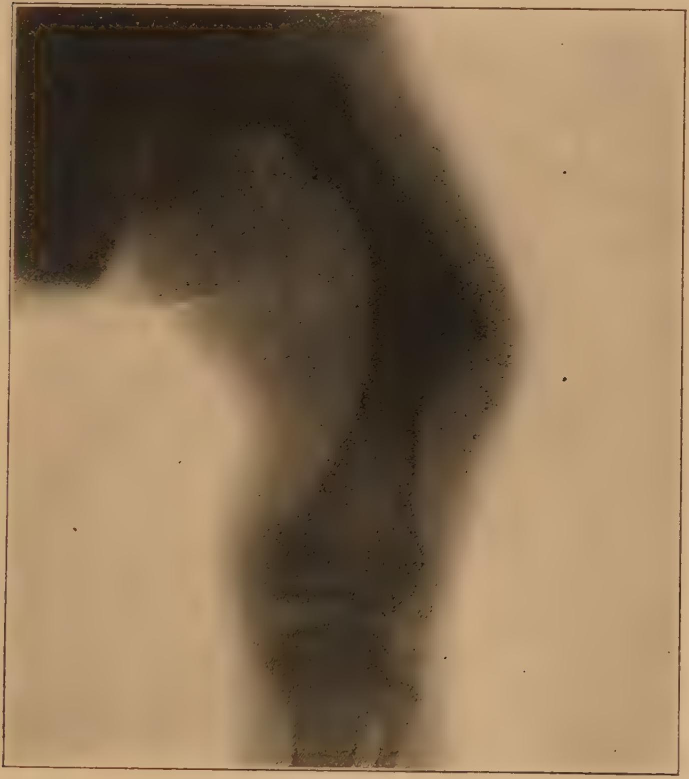

FIG. 12.—DEFORMITY FROM FRACTURE OF THE FEMUR.
Longitudinal and angular displacement. Shortening of 5 centimeters.

as the operation on the bones, and it is to this fact alone that we owed our success.

In these cases no new applications of the distensive force were continued.

In one of these cases, with the object of keeping the part more firmly immovable, and to obtain a good effect from the apparatus upon the evil tendency toward rotation of the most distant portion of the limb, two nails were fixed, one in the heel, and the other in the upper part of the tibia, and these were enclosed in the plaster apparatus.

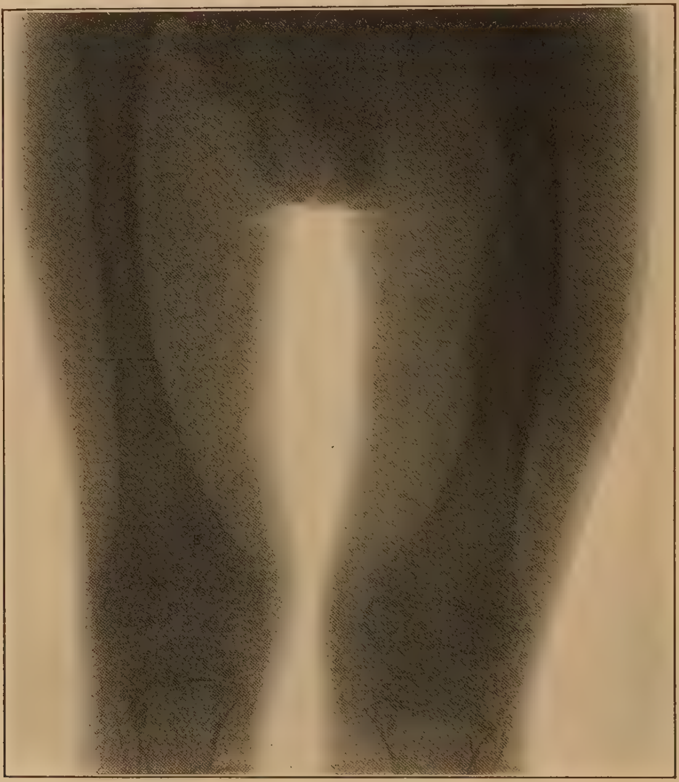

FIG. 13.—DEFORMITY FROM FRACTURE OF THE FEMUR CURED. Complete disappearance of shortening and of every deformity.

The method has borne the very best results, correcting the deformity, and diminishing, or completely removing the shortness of the limb. In cases of fracture of the femur, or in oblique osteotomy, the lengthening of the limbs has varied from 3 to 8 cm. After the traction on the nail has been accomplished the method has left no ill effects of any kind.

VI.

REPORT OF TWO CASES OF SUPPURATION OF RETROMESENTERIC LYMPH NODES.

BY JOHN C. PEGRAM, JR., M.D., PROVIDENCE.

The diagnosis of hip disease is, ordinarily speaking, an easy matter. When, however, we find the disease in its earliest stages, just commencing in fact, the differential diagnosis is by no means always to be made with certainty. We must wait, treat symptoms, and make the diagnosis ultimately on persistence of the signs of muscular spasm, sensitiveness, night cries, etc.

Two cases have of late come under my observation which illustrate one possible error in diagnosis so well that that fact alone makes them worth reporting. But besides this, the cases are interesting in themselves, both from their clinic and pathologic standpoints.

Case 1.—*Hospital Record.*—Morris M., age three years, white. Entered Rhode Island Hospital September 15, 1903.

Pres. Ill. Pt.—Fell on a hammer two weeks ago striking his left knee. About the same time, his parents noticed the child walked with a limp. Sleep was frequently disturbed by night cries. Leg became flexed, and walking more and more difficult. Case referred to Dr. Pegram by Dr. Church, of Warren.

P. H.—Pertussis two years ago, otherwise well. No tuberculosis in family history.

P. E.—Poorly developed and nourished, anemic-looking boy. Skin, pupils and chest negative. Left leg flexed 45° on the abdomen, and held rigid by muscular spasm; any attempt to move it causing the child to cry out. Elevation of surface temperature about left hip. Both thighs measure same. Examination of abdomen impossible, owing to muscular rigidity. Temperature 101°, pulse 120, on admission.

Presented at the Eighteenth Annual Meeting of the Association, at Atlantic City, N. J., June 8–10, 1904.

The child was put to bed on a Bradford frame with extension on the left leg in line of deformity.

September 16. Temperature 99°; pulse 110. Muscular spasm of abdomen has diminished markedly, and examination of the abdomen shows a well-marked tumor in the left iliac fossa.

September 18. Temperature 99°; pulse 120. Leucocyte count shows 18,600. Condition much the same.

September 19. Complains of pain in the abdomen. Restless and cried a good deal during the night.

September 20. Patient not so well. Temperature 101.6°; pulse 125.

Very tender in region of tumor, which is evidently an abscess. White count 34,800.

Operation advised, and child prepared. Two inch incision over fluctuating area in left iliac fossa.

Tissues of abdominal wall edematous. Muscles separated in layers, not divided. Peritoneum had been pushed up by abscess, and was not seen.

Abscess opened and large amount of thick greenish pus evacuated. Cavity flushed out with saline solution, and gauze drain inserted. Cultures from pus showed a pure growth of streptococci.

Recovery was uneventful.

Case 2.—*Hospital Record.*—Alice E., six years, white; entered September 19, 1903.

Pres. Ill.—Began to feel ill about two weeks ago. Ached all over and developed a fever. Continued so till last week, when she had severe pain in her left hip. Pain and tenderness have continued about the joint.

Child brought to the Out-Patient Department this morning and at once sent to House with diagnosis of acute hip disease. Temperature 101°; pulse 130.

P. H.—Measles two years ago; malaria one year ago lasting six months, and marked by pain in the back.

F. H.—Negative.

P. E.—Well developed and well-nourished child. Skin, pupils and chest negative.

Left leg held in flexion of about 30° slightly abducted. Hip extremely sensitive, and the least motion causes pain. Tense induration in the left iliac fossa with spasm of all the abdominal muscles.

Put on Bradford frame with traction by extension in line of deformity.

September 20. Leucocyte count 22,400. Temperature 100°; pulse 130.

September 21. Condition about the same, but pain is less, and flexion has been overcome some 20°. White count 19,400. Seems on the whole more comfortable. Temperature 99.5°; pulse 105.

September 22. Temperature 99°; pulse 125. White count 37,000. Tumor in left iliac fossa is evidently an abscess. Operation advised.

Incision three inches long over tumor. Muscles separated by layers, and not divided. Peritoneum had not been pushed up by the mass, which was deep. Abdomen was opened. General cavity walled off, abscess opened, and a thick greenish pus evacuated. Cultures taken showed pure growth of streptococci. Drain and walling-off gauze left in.

Recovery uneventful.

In this case I found a so-called shirt-stud abscess, that is, a collection of pus just beneath the abdominal wall; then a small sinus leading down into a larger pus cavity, deep in the iliac fossa.

I think this sinus led through two agglutinated parietal layers of peritoneum, which made opening the general peritoneal cavity a necessity.

The similarity of these two cases is to me striking. The history in each case naturally suggests acute hip disease, the first, if anything, more than the second, but the clinical picture in each case was practically the same. The symptoms being referred to the left side in each case, made appendicitis unlikely and other symptoms of that disease, such as nausea and vomiting, were wanting.

Each child held his left leg firmly flexed some 30° on the abdomen, and any motion at once made the pain more severe.

The abdominal muscles chiefly on the left side were rigid, but not more so than I have often seen them in acute hip disease.

Case 1 was brought to my office and I told the father that the trouble was probably hip disease, but I was unwilling to make a positive diagnosis without further observation and recommended his immediate admission to the hospital. I confess it was only a possible acute Pott's disease with a psoas abscess, and nothing else that I thought entered into the differential diagnosis. Case 2, on the other hand, I did not question as being a hip disease when I first saw her. The rapid development of Case 1, with the finding of the tumor after the subsidence of the spasm under extension, permitted examination of the abdomen, called my attention closer to Case 2.

A blood count here and the discovery of a tumor in the left iliac space decided me to operate on this case with the result recorded.

A study of the structures in the left iliac fossa makes me feel that the most likely tissue to be here infected and produce abscess by such a virile organism is a retromesenteric lymph node. Lymph nodes are the filters of the lymph stream, and the most likely place for an organism to lodge and set up inflammation. I do not question but that delay in operating might very well have been followed by a rupture of the abscess into the general peritoneal cavity with a fatal streptococcus peritonitis as a result, though I am well aware of the ability the peritoneum has of defending itself against burrowing extraperitoneal pus.

VII.

THE OPERATIVE TREATMENT OF PES CAVUS.

HARRY M. SHERMAN, A.M., M.D., SAN FRANCISCO.

I have always found the deformity called hollow claw foot, *Griffe pied creux*, a difficult condition to manage. It is true that section of the plantar fascia and a forcible extension of the fore part of the foot upon the hinder part, and perhaps an achillotomy added to correct the relation of the foot to the leg, has overcome the deformity; but the position gained has not been maintained, and I have been correspondingly disappointed.

The fault in this operation lies in the fact that no force is arranged for *in the foot and leg* to maintain the corrected position, and an extraneous retentive force is either painful or inefficient.

In the feet which I have seen, the deformity has quite plainly been due to paralysis of the plantar interossei and lumbricales.

Normally, action of these muscles, holding the toes straight or even a little flexed, transfers the extensor effect of the long toe extensors—that is, the extensor proprius pollicis and the extensor communis digitorum—from the toes to the metatarsus, and extends it on the tarsus. Paralysis of these two sets of muscles, plantar interossei and lumbricales, permits the action of the toe extensors to be expended wholly on the toes, pulling them into marked hyperextension and permitting the metatarsus to stay in, or go into a flexed position on the tarsus. The long toe extensors with the combined action of the plantar interossei and lumbricales are consequently the chief metatarsal extensors; the effect of the tibialis anticus and the peroneus tertius on the metatarsus is not very great; and the metatarsus has no special extensor muscles of its own.

The proposition was a simple one—give to the metatarsus extensor muscles to antagonize the flexor force of the plantar groups and so prevent persistent midtarsal and tarso-metatarsal

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flexion with consequent retraction of the plantar fascia. The needed muscles were found in the long toe extensors themselves, and the operation I have done has been to cut the tendons of these muscles from their insertions into the toes and transplant them into the metatarsal bones just behind their heads.

I have formulated and followed the following technic:

1. Because of the difficulty of holding a foot in a certain position while five tendon sutures were done I have, after such subcutaneous sections of fascia and tendons, and such manual or instrumental remodeling as was necessary to correct a malposition or deformity, put the foot into a plaster-of-Paris splint in the corrected position. Then, immediately after the setting of the splint, I have cut away so much as was necessary from the dorsum, exposed the field of the operation and been able to do the work on the tendons quietly and without the danger of any slipping of the foot which might tear out some of the earlier sutures while the later ones were being placed.

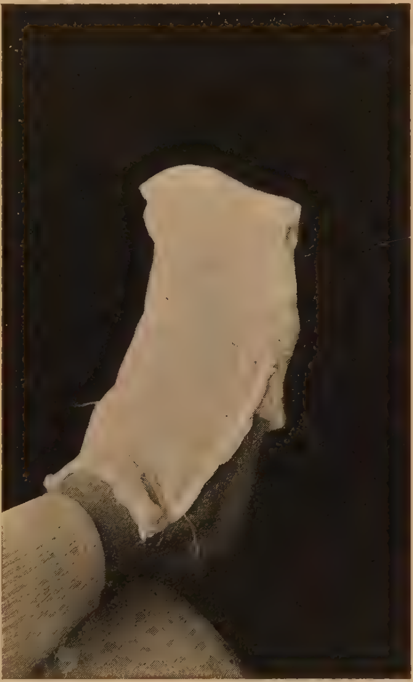

Fig. 1.—Sterile Gauze Kerchiefs on the Foot Before the Application of the Plaster-of-Paris Splint.

2. Because of the practical difficulty in putting the tendon under the periosteum of the metatarsal bone, and suturing it there while working wholly on the dorsum and in a somewhat limited space, I have carried my sutures directly through the foot and the plantar part of the splint, and have fastened them firmly on the outside of the latter. In this way I can hold the tendon closely against the denuded bone under the periosteum

and can maintain the position as long as an absorbable suture will last, and that may be about forty days, if chromicized catgut is used.

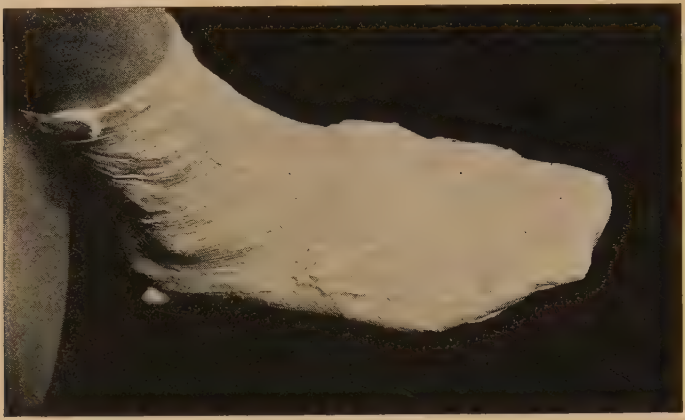

Fig. 2.—A Quadrilateral Opening in the Dorsum of the Splint, Exposing the Gauze Underneath.

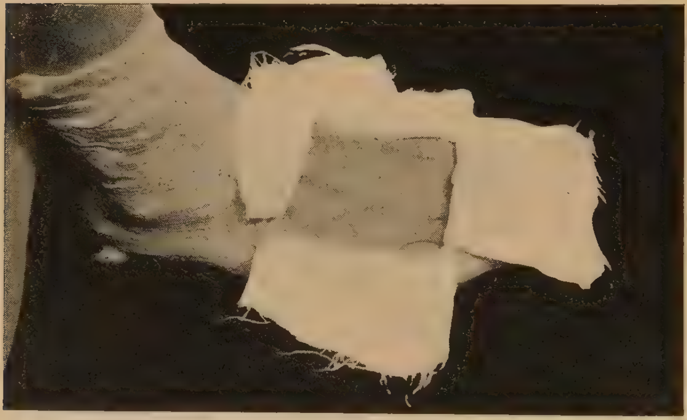

Fig. 3.—The Kerchiefs Folded Back, Exposing the Skin Beneath.

The details of the operation are as follows. Sterile gauze kerchiefs are disposed about the foot and next to the skin, so that they can be folded back after the opening in the splint is made (see Fig. 1) and be made to cover the uncut part of the splint itself, and give a sterile surrounding to the operation field. The splint is then put on, permitted to set with the foot in the corrected position, the dorsal part of the splint cut away (see Fig. 2) and the kerchiefs folded back (see Fig. 3) and fastened by a sterile bandage (see Fig. 4). A quadrilateral flap is now made, its attached base at the tarso-metatarsal line, its sides at the inner side of the first and the outer side of the fifth metatarsal bone, and its free margin at the metatarso-phalangeal line. The turning back of the flap exposes all the toe extensor tendons as they traverse the metatarsus. The extensor proprius pollicis tendon is now picked up, cut behind the head of the first metatarsal bone and just turned back from its sheath. The periosteum thus exposed is incised along the dorsum of the bone and separated toward either side. Two chromicized catgut sutures, each having a long, strong, straight Hagedorn needle on either end, are passed transversely through the tendon, nearer its dorsal than its plantar surface, the distal sutures about 1 cm. from the cut end and the proximal about the same distance behind this. One of these needles is passed on either side of the bone, between it and the reflected flap of the periosteum, and then on through the sole of the foot and the plantar part of the splint. Now, when these two sutures are pulled taut and tied on the sole of the splint, the tendon is held tight to the denuded bone and

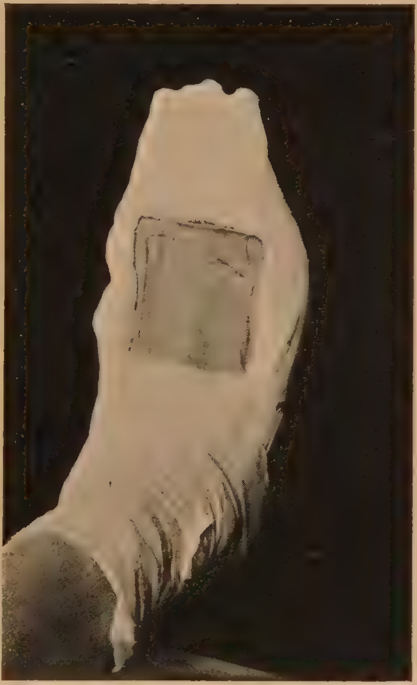

FIG. 4.—THE KERCHIEFS BANDAGED DOWN BY A STERILE BANDAGE, GIVING THE OPERATION FIELD A STERILE ENVIRONMENT. SHAPE AND SIZE OF THE FLAP OUTLINED ON THE SKIN IN INK.

is partly covered by the flaps of periosteum (see Fig. 5). The value of the splint is now seen, for this toe may be disregarded during the operation on the others. The other tendons are treated in an exactly similar fashion except that it seems that one suture may be enough for a tendon instead of two. After the last tendon is sutured the flap is replaced and stitched by a subcuticular suture, a proper dressing is put on and another plaster-of-Paris bandage is put about it all to retain the dressings and strengthen the splint. Unless there is some reason for doing otherwise the dressing and foot are left undisturbed for six or eight weeks. To get the best functional result the foot should be in a position of slight dorsal flexion (extension) at the ankle joint.

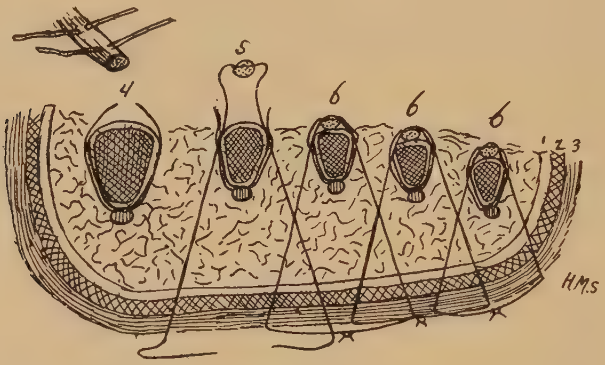

Fig. 5.—Schematic Section of Foot at Point of Suture.
1. Integument. 2. Layer of gauze. 3. Plaster-of-Paris splint. 4. Sutures through the tendon, and the bone and periosteum prepared for the suture. 5. The suture in the tendon and through the foot and splint, but not pulled taut and tied. 6. The tendons fastened in their subperiosteal location, and the sutures tied on the outside of the splint.

Now in all the cases in which I have done this, eight feet in six children, the immediate result has been what was intended. The effort to lift the front of the foot really did lift it, and was not wasted in hyperextension of the toes. But in two cases it has seemed that the big toe tendons have become loosened from their insertions on the metatarsal bones, have reunited to their distal ends and resumed their original insertions; and in one case this was followed by a partial relapse into the deformed position. To prevent these I have, in later operations, cut off as much as possible of the distal end of the tendon, but it may be found necessary to use a more permanent suture material, such as silk, which can be buried in the foot and left there, instead of the chromicized catgut. If that is done it should be passed around the bone by an aneurysm needle, or a Durham or Goodwillie needle, so as to make its location definite. This plan I have not yet tried. It might, again, be possible to use silkworm-gut sutures, in the manner described for the catgut, and to slip them from their places in the tissues at the end of the time of splint restraint. This also is untried by me.

The correction of a deformed position before an operation on tendons to maintain this correction is, of course, a usual matter—but the application of a splint to maintain the correction easily and surely during the tendon transference is an addition to the technic of not indefinite value.

In talipes calcaneus, when it is intended to transplant the tendons of some of the posterior tibial group of muscles to insertion into the os calcis, to take the place of the sural muscles, it is advisable to correct the position of the os calcis definitely and to let this be the limit of the first operation. At a later time, with the foot still in the retentive splint, the operation on the tendons can be done with a quiet certainty which is foreign to the operation where an assistant's hands must be trusted to maintain the new position during the suturing of the tendons and of the incisions, and while the splint is put on and has set.

If the tendon operation is done at the same time as the corrective procedure, it then will be possible to practise the suture which passes through the foot and splint and ties on the outside of the latter, for the needle passes with but little difficulty through the freshly set plaster-of-Paris bandage. But there is one practical point which must not be forgotten. A needle which has passed through the plaster-of-Paris splint must not be considered aseptic and rethreaded for use on another suture. On the contrary, it must be considered as septic, and be resterilized before it is used a second time. Again, there must be no to-and-fro pulling of the sutures after they are in place else plaster-of-Paris may be carried back into the wound with the great possibility of its infection. Moreover, when the splint is removed it is necessary to see that the foot is not bound to the splint by unabsorbed sutures, as may happen.

I have applied this simple plan of putting on the retentive splint after the correction of the deformity and then immediately doing the operation on the tendons, through a fenestrum cut in the splint, not only in the operations described, the transposition of all the toe extensor tendons to metatarsal insertions, but also in the transposition of posterior tibial and peroneal tendons to os calcis insertions, and in transposing the extensor proprius pollicis to an insertion on the cuboid or fifth metatarsal to take the place of paralyzed peroneals, and once in an operation on an extensor tendon of a finger, in which the little middle slip of the extensor communis digitorum, which is inserted into the base of the second phalanx, had been cut by a punctured wound. In this instance the chromicized gut suture pierced the tendinous slip transversely, then was led by fine needles through two holes which had been bored in the bone at the proper places and then passed through the integument of the flexor aspect of the finger, on either side of the flexor tendons, then on through the splint where the two ends were tied. The union of the tendon to the bone, in this instance, was most satisfactory. In giving tendons new insertions on the os calcis it is, also, necessary to drill holes through the bone for the passage of the sutures to the sole.

As regards the results of the operations on the cases of hollow claw foot, one patient in whom the implantation of the tendon was not secure, may be counted a failure in one foot, and a partial success in the other. All of the other cases have been satisfactory so long as I have been able to follow them, but that has been only for a comparatively few months, and this report can be considered as only suggestive and provisional.

Another patient operated upon since the writing of this paper demonstrates perfectly the transference of the action of the long toe extensors to the metatarsus.

VIII.

AN APPARATUS FOR HANDLING CASES OF ACUTE POTT'S DISEASE IN ADULTS.

COMPTON RIELY, M.D., BALTIMORE.

This apparatus was devised for handling a case of dorsal Pott's disease with paralysis in an adult female patient of rather large stature, who when moved for purposes of bathing, using the bed-pan or making her bed, suffered violent pain and spasms of all the muscles below the seat of disease. It required three or four attendants to handle her, hence the necessity for such a device that she might be cared for comfortably and by one nurse. It could also be used in cases of other paralyses, fracture of the spine and tubbing typhoid cases; the latter by having a Bradford frame small enough to allow of its immersion.

The apparatus consists of a quadrilateral and a Bradford frame. The quadrilateral frame, made of 1 inch gas pipe, is 6 feet high, 7½ feet long and 3 feet wide. Attached to the lower end of each upright, there is a small plate with screw holes, for making it fast to the floor.

Attached to the uprights at one end of the frame there is a windlass about three feet from the floor which has a crank for winding and a ratchet or catch for holding it at any point, so as to prevent the patient from falling. There are also two collars with set screws on the windlass for making fast one end of all the ropes. In the cross-piece of this frame above the windlass there are four hooks, on which to hang pulleys and in the opposite piece, there is a hook near each end for the same purpose.

The Bradford frame is made of 3-inch pipe, is 6 feet long and 2 feet wide and at each corner, there is an S-shaped hook by means of which pulleys are attached. There are ten 2-inch

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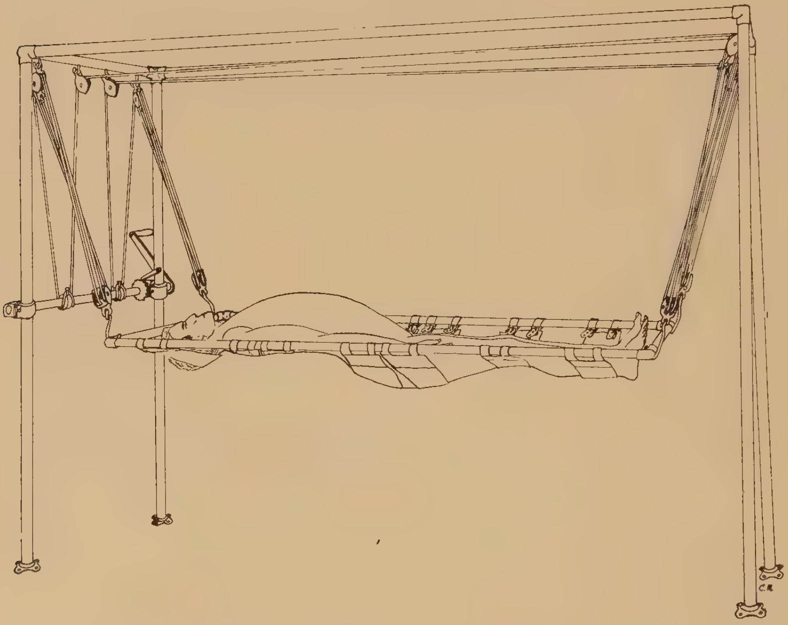
Presented at the Eighteenth Annual Meeting of the Association, at Atlantic City, N. J., June 8–10, 1904.

pulleys, eight of which are double or compound and two are single. Four of the double ones have rings or loops at both ends of their blocks and these are suspended on the four hooks near the four corners of the quadrilateral frame and the other four are attached to the Bradford frame.

The two single pulleys are suspended from the two middle hooks of the cross-piece above the windlass.



Apparatus for Handling Cases of Acute Pott's Disease in Adults.

There are four ropes of suitable sash cord for suspending the Bradford frame within the other. One end of each of these is tied to the lower loops of each corner pulley of the quadrilateral frame, then they are carried through the pulleys, etc., until all have been threaded, all ending at, and being made fast to, the windlass, those from the farther end first passing through the single pulleys.

There are seven pieces of 5-inch girthing shorter than the width of the Bradford frame. Each end of these straps is reinforced with leather and has attached to it two buckles and two straps for fastening it to the frame. They can be made tight or loose as desired.

The bed used with this apparatus should be single, made of iron and have 4-inch rollers in order that it may be moved about easily. To use the apparatus the girths are placed under the patient in the following manner: one to support the head, two to support the kyphos (one just above and one just below) two under the buttocks placed closely together, one under the knees and one under the feet. The bed is then rolled under the apparatus, the Bradford frame lowered and the straps buckled to it. Those under the kyphos are made very tight, those under the head and buttocks loose, so as to produce hyperextension. The ones under the knees and feet are moderately tight.

Now to be able to bathe that part which is covered by the straps and at the same time keep the patient in hyperextension one strap is unbuckled at a time. This, as everything else necessary to comfort, is done without moving or causing pain to the patient, under whom the straps remain all the time, as they were arranged on the bed.

DISCUSSION.

Dr. R. Tunstall Taylor stated that he had seen the device used in a case of extreme motor and sensory paralysis where the slightest movement of the sheet would cause intense muscular cramp. The condition was such that some device had to be made to move the patient without the induction of such great pain. This the apparatus had quite successfully accomplished.

Dr. Myers stated that he had seen almost the same device used eighteen years ago and that it had been found very useful.

Dr. Riely said that the difference between this apparatus and others devised for the same purpose lay in the general and convenient suspension of the patient so that it was unnecessary to turn the patient in order to bathe the back.

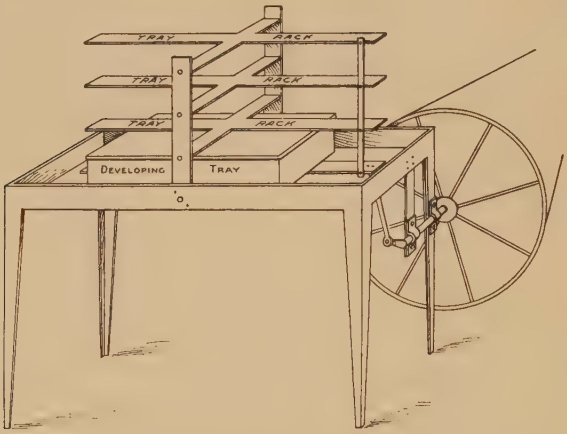
IX.

APPARATUS FOR DEVELOPING X-RAY NEGATIVES.

COMPTON RIELY, M.D., BALTIMORE.

This apparatus was devised to develop a number of X-ray plates simultaneously, thereby enabling one to save much time.

No description is necessary, as the diagram shows plainly its construction. It can be run either by an electric or a water motor. The speed must be slow enough to allow the solution to move gently and evenly over the plates, for when the rocker is in rapid motion the solution remains practically motionless. The trays should have light-proof lids in order that the operator might leave the dark room during the stage of development.



APPARATUS FOR DEVELOPING X-RAY NEGATIVES.

The trays should be changed alternately from the longitudinal to the transverse position on the racks, from time to time, to prevent streaking the plates. As each plate is put into its

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tray with the developing solution, it is placed on a rack of the apparatus. The rocker is set in motion as soon as the first tray is put in position and is stopped only long enough to place the additional trays on their racks, or while shifting the trays or examining the plates, until their development is completed.

X.

REPORT OF TWO CASES OF CONGENITAL DISLOCATION OF THE SHOULDER-JOINT.

FRANK E. PECKHAM, M.D., PROVIDENCE, R. I.

The comparative rarity of such dislocations and the small number that have been reported are the excuses for presenting these cases. There seems to be some discussion as regards the ability to definitely know whether such dislocations are congenital or not. In Case 1 no electrical tests were made before operation. The X-ray plate, however, was taken and tells its own story.

CASE 1.—R. M. G., age eleven months. Referred by Dr. Rutherford. *Physical examination* showed the right shoulder to be dislocated so that the head of the humerus was under the spine of the scapula. With the head between the fingers rotation could be distinctly felt in this position. The arm was rotated inward so that the back of hand looked forward and inward much like an obstetric paralysis. The baby was unable to turn the arm or to get the hand anywhere near the mouth. There was almost no power of elevation and any attempt at motion in this direction carried the scapula with it on account of the locking of the head under the spine of the scapula. Reduction was possible but the head of the bone refused to stay in the socket. The X-ray plate shows humerus is somewhat smaller than on the well side. There was no violence or protracted labor or any other evidence of traumatism. Although there were no electrical tests made, I think the muscles would have reacted as there seemed to be no paralysis.

Operation, June 25, 1903.—The joint was opened from behind, the Phelps operation being used. The head of the bone being found beneath the spine of the scapula as previously described. The glenoid fossa was apparently normal although the finger was not inserted to ascertain whether the shape was changed. Reduction was made and found to be stable when a certain amount of external rotation was made. The capsule

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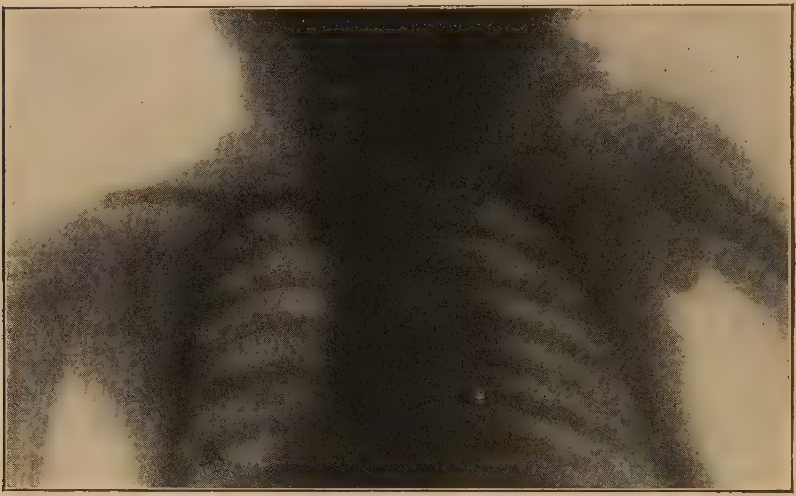
was closed without any resection and the arm bandaged and held firmly with sufficient external rotation to keep it in place. After the bandages were omitted the arm was still held to the side by adhesive plasters, thus allowing some use of the hand. It was not until October 7, 1903, that all bandages and straps were omitted, being a little over three months after the operation. The arm was then in the correct position but the baby used it very little. Passive motion was made use of and the arm constantly elevated above the head in order to restore the motion in extreme abduction. The ability to use the arm has increased slowly. At present the baby can get the hand to the mouth but cannot seem to raise the arm any higher.

Case 1.—Congenital Dislocation of Right Shoulder.
(From *Archives of Pediatrics*.)

Case 2.—M. S., age 22 months.

There was no history obtainable of the birth of this child, so it is not known whether it was instrumental or protracted. The physical examination showed the arm to be hanging by the side as in an obstetric paralysis. The arm was rotated inward, the back of the hand looking forward and somewhat inward and the child unable to get the hand anywhere near the mouth or to use it very much in this position. The head of the humerus could be felt under the spine of the scapula and any attempt at elevation in the line of abduction forced the scapula to go with it. An X-ray plate showed the absence of the head of the bone from its socket. The electrical tests were very carefully made for me by Dr. Shattuck, all of the muscles being found to react to both the Faradic and galvanic currents, the reactions being possibly very slightly less than on the normal side.

Operation, October 7, 1903.—The Phelps operation was done, the head of the bone being found under the spine of the scapula as described. The glenoid fossa was normal. The head was reduced and in this case a small portion of the capsule was excised. As in the preceding case the arm had to be bandaged with some external rotation in order to prevent re-dislocation. The dressings were removed November 14, five weeks after operation and passive motion begun. The bandages were removed very much sooner in this case, hoping thus to obtain freer motion, but such was not to be the case. At present the baby gets its hand to the mouth and is using it a little better as time goes by.



Case 2.—Congenital Dislocation of Left Shoulder.
(From *Archives of Pediatrics.*)

Conclusions.—As far as can be seen the results are about alike in the two cases, and why there should be inability to elevate the arm is not evident. Phelps advised putting the arm up straight at the first dressing thinking thereby to secure motion in this direction.

In Case 1 there was positively nothing done that could not have been done without cutting, and in another case at so young an age I should feel like reducing without operating and bandaging the arm in the same position as above for two or three months and see if the result would not be just as good if not better.

DISCUSSION.

Dr. Porter reported a case of congenital dislocation of the shoulder with all the characteristic symptoms as given by Dr. Peckham. The patient refused operation. The dislocation had been reduced several times but would not stay reduced. No mechanism would keep it in place. There was some doubt cast on the diagnosis of the dislocation being congenital. Scudder, of Boston, states that in infants the differential diagnosis can be made by studying the comparative development of the two sides. The scapula, clavicle and the bones of the arm in such cases are not completely developed. They are smaller and shorter, whereas in traumatic dislocation there is no reason for a difference in the development. By bearing these points in mind one should be able to settle the diagnosis whether congenital or traumatic.

XI.

THE VALUE OF X-RAY NEGATIVES IN THE STUDY OF ORTHOPEDIC PATHOLOGY.

ROBERT B. OSGOOD, M.D., BOSTON.

As in the evolution of any new discovery applicable to medicine, the opinion of the profession in regard to the value of the Röntgen rays has passed through certain stages. These may be described as the stage of enthusiasm, the stage of disappointment, and finally the stage in which the true value is admitted and the limitations recognized. The Röntgen rays have certainly passed through two of these stages, while the third stage is not yet fully reached in the minds of many.

It is the purpose of this paper, which I have the honor to present to you, to consider the limitations of the method and a few of the points which make its use of positive value.

In unskilled hands the therapeutic use of the X-ray includes the serious danger of burns. To the practitioner unfamiliar with normal X-ray anatomy the interpretation of skiagraphs offers the no less serious danger of incorrect diagnosis and vicious or useless treatment.

There are certain definite rudimentary conditions which must be complied with in order to base any fair judgment upon results.

I. As far as is possible we should have the negative for our examination and not a print. In examining a negative two factors are of great importance: (1) Light and (2) distance. 1. The former should be evenly diffused, and that surrounding the negative should be cut off. 2. By distance is meant the examination of the negative at more than arm's length. The less evident lesions and differences of shadow are thus much easier ,to see. Ludloff, of Breslau, one of the most scientific

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observers and accurate interpreters of X-ray plates, places his negatives in a frame before a well diffused light, and from a distance of from fifteen to twenty feet examines them with powerful opera glasses.

We should demand a good negative. By this is meant a negative in which soft part detail is not obliterated and in which fine bone structure is shown. It is possible by proper choice of the light quality to so shorten the time of exposure and development that soft part lesions will be most favorably shown, while with more penetrating rays, longer exposures, and with the development carried farther, the bone structure may be emphasized. In the thinner parts a combination of both can be usually obtained.

II. There should be also standard positions of the parts to be taken and standard positions of distance and focus of the Crookes's tube.

To appreciate possible distortion one has simply to place his arm between a fluoroscope and an active tube and move the fluoroscope and arm laterally. The amount of distortion thus obtained is surprising.

It seems hardly necessary to describe in detail these standard positions. A thoughtful consideration will indicate the most satisfactory and complete view of the joint and therefore the standard position.

Until absolute standards are generally adopted the data of position should be known before attempting to interpret the negative.

III. Familiarity with the normal.

In the medical school the student has long and thorough training in normal histology before he is shown pathological tissue. We dissect normal subjects before we are expected to recognize the gross lesion.

In skiagraphy we are dealing with shadows of structures, not visual tactile examinations of these subjects.

X-ray anatomy differs materially from that of the dissecting room. Moreover, the bony structures of children at different ages differ very much from each other and from those of adult life. Yet the adult structures are the only ones in which we receive our anatomic training, while the bone diseases of children are more common and of greater import than those of adult life.

It is of importance, therefore, that we should become familiar with normal skiagraphs of all ages and compare either mentally or actually the negative supposed to be pathologic with a normal one of approximately the same age. Thus only can we progress in our power to safely use the Röntgen rays as an accurate method of diagnosis.

In the majority of cases lesions are unilateral and we have the other side for our most perfect normal standard. Where it is impractical to take both sides on the same plate at the same time, symmetric positions must, of course, be taken. One acts as a check upon the other, and individual idiosyncrasy does not stand for the suspected lesion.

The value of the normal standard is by no means confined to cases of suspected bone disease. Many of the traumatic conditions demand the same care and comparison.

For example, the tibial tubercle is the seat of injury more often than we have been accustomed to consider before the advent of the X-ray. Its mode of development makes the normal comparison essential. Before adolescence there is scarcely any evidence of a tibial tubercle. With adolescence the rapid development of the tubercle takes place either as a separate bone center or as a prolongation down of the upper epiphysis. With the athletic life of this age powerful contractions of the quadriceps frequently pull off a piece or start the epiphysis. The latter it is very difficult to determine without normal comparison.

IV. Experience is naturally of great value in interpreting lesions, and ignorance at times dangerous.

A woman twenty-nine years old, with negative family history and pain and swelling over outer side of right elbow, appeared at a hospital out-patient department. Duration of symptoms, one year; no acute symptoms when seen. The physical examination was not sufficient for diagnosis. A skiagraph was taken. We had had little experience in interpreting X-ray negatives, and while a lesion was plainly evident, its character was not.

She was referred to the hospital for exploratory operation, but in the absence of acute symptoms allowed to wait her turn, and in some way failed to enter. Six months later she reported for observation with practically the same physical signs as before. She had been doing her housework and caring for six children. Another X-ray taught us nothing, not because it was a faulty method of diagnosis, but because we were ignorant of its significance. Acute symptoms set in two months later after a wrench of the arm and a third skiagraph showed a spontaneous fracture above the condyles and a general involvement of the bone by a malignant process.

After an immediate exploratory incision and microscopic examination the arm was amputated at the shoulder for a rapidly growing round-celled sarcoma.

The first X-ray was sufficiently typical of this to have at least compelled an immediate exploration.

The case has seemed worth reporting because it teaches the necessity of more careful and experienced interpretation of X-ray negatives.

It is impossible in the limits of this paper to consider thoroughly the details of interpretation which are known even in this infancy of the method. The following few diseases will be considered, some because of their frequent occurrence, some because of the little attention they have received at the hands of the X-rays, and finally a method of technic, because it broadens the field of usefulness of the Röntgen rays in the study of orthopedic pathology. For the opportunity to report many of the following cases my thanks are due to Dr. Joel E. Goldthwait of Boston.

TUBERCULOSIS AND OSTEOMYELITIS.

These represent, perhaps, the most common bone diseases. Certain forms of both resemble each other clinically, especially in the early stages. The distinction between them in the X-ray negative is usually not difficult and often is of the greatest value.

Tuberculosis is thought by many of our best pathologists to be always primary in the bone. If this is so, the X-rays repeatedly fail to demonstrate these early foci. It is not *uncommon* in the negative to find a distinct focus in the bone, but it is *more common* to discover first the thickened capsule and later the erosion of the articular surfaces and finally real destruction of bone.

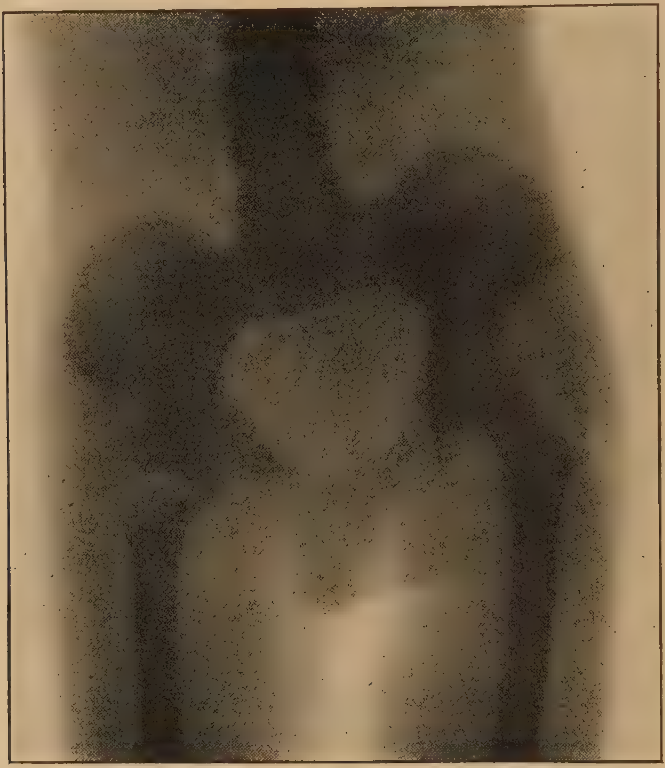

FIG. 1.—TUBERCULAR DISEASE OF HIP JOINT.
Acetabular involvement. Bone of less density and smaller size on affected side. Whole shaft shows atrophy.

The focus of disease when found gives little evidence from the X-ray point of view of any inflammatory bone process about it and appears as a thin-walled cavity.

There are other strong evidences of tuberculosis where these more striking conditions are absent. Even before we can demonstrate the soft part atrophy which is so constant an accompaniment clinically, we are able to discover in the negative atrophy in the bone in the very early stages of the disease, often long before we find any distinct focus. This is of the greatest importance in the cases of early hip disease, and here again we must have the unaffected side for comparison, preferably taken on the same plate and always with the Crookes's tube focused over the median line of the body.

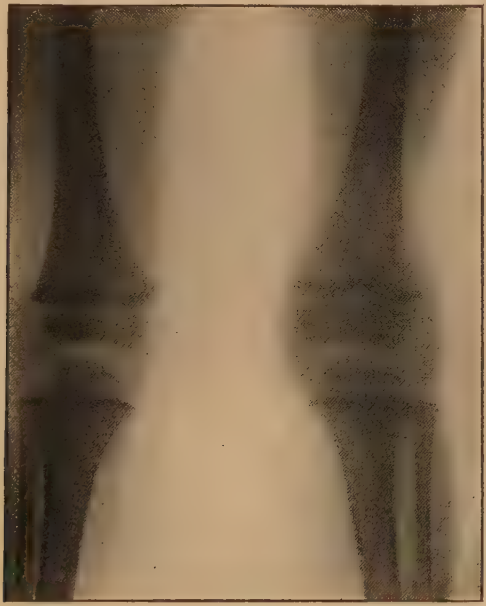

FIG. 2.—EARLY TUBERCULAR DISEASE OF KNEE.
Epiphyses on affected side enlarged and squared. Clear shadow of fluid or thickened capsule. No bony focus seen.

The lessened shadow cast by the bone of the affected side, owing to the diminution in the lime salts, and the slightly smaller diameter of the shaft, should make one very suspicious of tubercular disease. (See Fig. 1.)

Tuberculosis in a joint before the destructive stage ensues represents a marked irritation, and, of course, often stimulates epiphyseal growth. Here we find the explanation of the often-noted fact that in the early stages of tumor albus and hip disease the affected limb is actually longer than the well side. In the negative we find as a help in interpretation the characteristic enlargement and squaring of the epiphyses. (See Figs. 2 and 3.)

As the process progresses, destruction is the most characteristic feature. The bone breaks down, dislocations occur, and detritus is thrown out with or without circumscribed abscess formation. (See Fig. 4.)

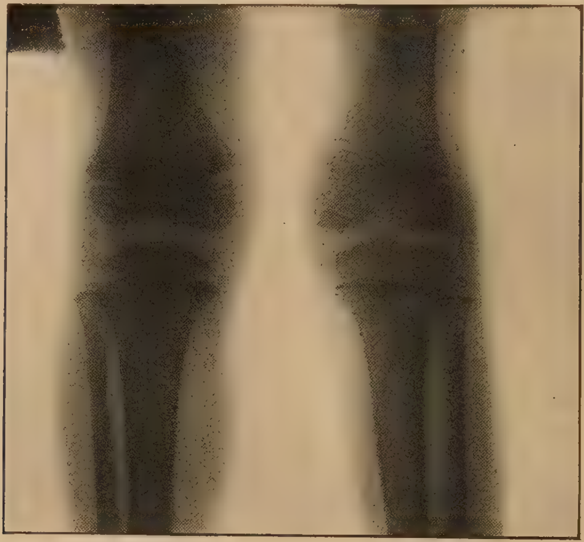

FIG. 3.—SAME CASE AS FIG. 2, TAKEN TWO YEARS LATER. Excellent functional result. Enlargement of epiphyses still persists. Atrophy in size of shafts both above and below joint.

Finally comes repair, with new bone formation and ankylosis, or a new joint with more or less motion and sometimes good functional adaptability. (See Fig. 5.)

In contrasting osteomyelitis with tuberculosis it may be said that while tuberculosis commonly affects articular surfaces, osteomyelitis more rarely does so. It is often found in close proximity to joints, but as a rule there is no involvement of the articular surfaces in the early stages.

Except in the very long standing cases where actual disuse has a chance to play a part, we rarely find in osteomyelitis the bony atrophy which is so constant an accompaniment of tuberculosis.

There is to be seen, especially in the more chronic cases, an actual thickening of the bone cortex and a ring of bone about the cavity which is more resistant to the passage of the X-rays than the rest of the shaft.

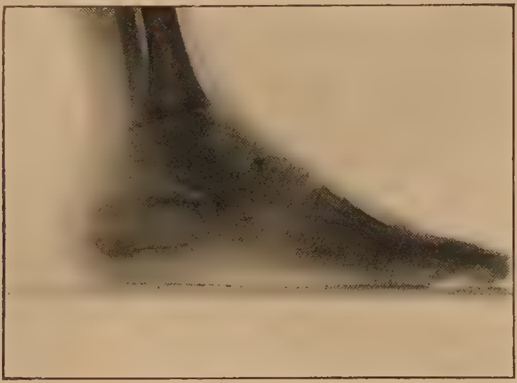

FIG. 4.—TUBERCULAR DISEASE OF TARSUS.
Much bone destruction, especially of astragulus and scaphoid, with detritus. Atrophy of bone structure.

The two processes resemble each other in that they are both destructive at some stage, and also in the fact that at times they exhibit the characteristics of an almost malignant process, showing tendencies to fresh outbreaks after very long periods of apparent cure.

Clinically, of course, we have often the acute onset and sharp steady pain with a high temperature to aid in the diagnosis.

In considering the X-ray evidences of osteomyelitis it is perhaps better to try to show types than stages, for osteomyelitis is a disease of so greatly varying an etiology that it possesses no typical stages.

1. There is a type of acute or subacute circumscribed osteomyelitis often presenting clinically some difficulty in differentiating from tuberculosis. It is one of the most satisfactory X-ray diagnoses, for its dictum is almost absolute and the simplification of treatment in the way of operative measures is very great. It is comparatively common. (See Figs. 6 and 7.) Noting:

FIG. 5.—HEALED TUBERCULAR DISEASE OF THE HIP.
New joint with complete extension and 100 degrees of flexion possible. New acetabulum and weight-bearing pillar formed. Atrophy of size and structure persists. See Fig. 1.

(*a*) Area of cavity.
(*b*) Thickening of wall and cavity.
(*c*) Absence of atrophy.
(*d*) Perfect localization.

In all these cases we have seen, a pure culture of either the *Staphylococcus pyogenes aureus* or *Staphylococcus pyogenes albus* has been obtained at operation.

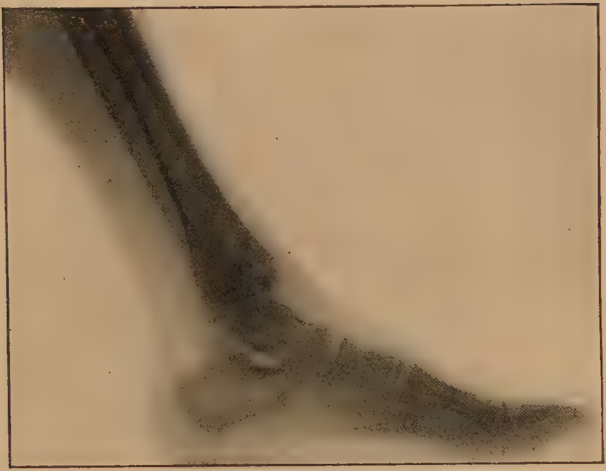

FIG. 6.—CIRCUMSCRIBED OSTEOMYELITIS OF TIBIA.

Circumscribed cavities in lower end of shaft and at epiphyseal line. Articular surfaces not involved. Culture *Staphylococcus pyogenes aureus.* See Fig. 7.

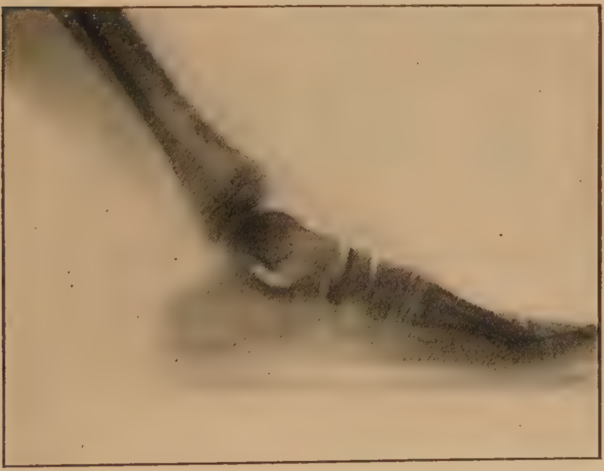

FIG. 7.—SAME CASE AS FIG. 6, TAKEN TWO YEARS LATER.

After operation. New trabeculæ formed in areas of old cavities. Epiphyseal line irregular at site of old infection. No subjective symptoms.

A far more serious condition is an acute type, which is much more diffuse, often involving nearly the whole shaft of a bone. (See Figs. 8, 9 and 10.)

This case is of a six-year-old girl. She was allowed to be exposed to measles, in order, as was hoped, to get over early in life one of the diseases looked upon as necessary ills of childhood.

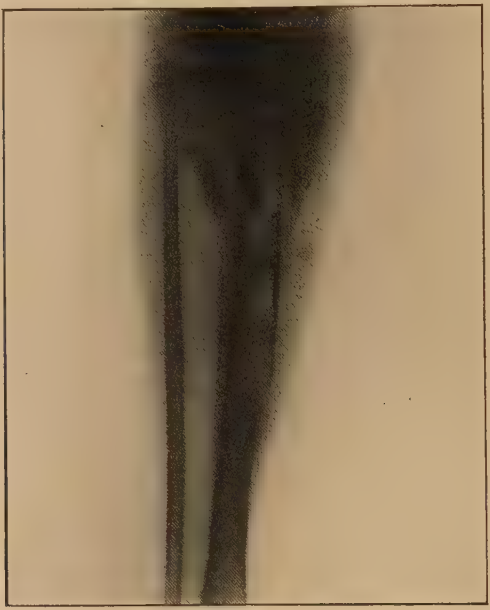

FIG. 8.—DIFFUSE OSTEOMYELITIS FOLLOWING MEASLES.
Whole upper two-thirds of tibia affected. Epiphysis involved. See Figs. 9 and 10.

Ten days after the onset of the measles an acute osteomyelitis of the tibia ensued with abscess formation. Upon incision the whole upper half of the tibia was found denuded of periosteum.

An osteomyelitis ensued. From the X-ray it is evident that drainage was the only possible operative measure that could at this time have been employed.

The subsequent plates (of which three are herein shown), at intervals of four months, six months, and one year, and two years, were interesting as demonstrating how perfect a repair Nature may accomplish.

The involvement of the epiphyseal line was, of course, the most serious feature in its relation to future growth of the limb. On careful measurement from time to time it was found that enough of the growing center remained to have the irritation actually stimulate the growth as in tuberculosis. The sinus was allowed to persist until the leg had become one-quarter inch longer than the normal side. Then the necrotic area was removed and the sinus closed. Fig. 10 shows the present condition.

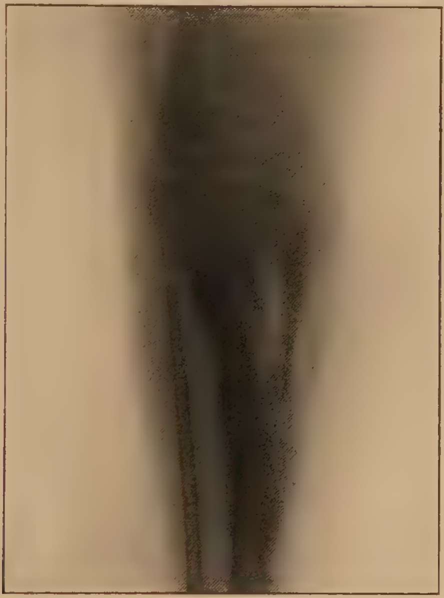

Fig. 9.—Same Case as Fig. 8, taken One Year Later.
Sequestrum forming. Shaft repairing rapidly.

3. There may also be said to be a mere chronic circumscribed type. This is a form of osteomyelitis which is often most obscure, and here again the X-ray should help greatly in the diagnosis. (See Fig. 11.)

Note.—(*a*) The cavity in very dense bone represents a very resistant wall for the pus to break through. (*b*) The amount of thickening. (*c*) The articular surfaces free, and the proximity of the joint. (*d*) There had been a history of periods of so-called rheumatic pain for twenty years, said to have been in the knee. The limitation of joint motion with the acute attacks and the localization of the pain in the close proximity of the joint had allowed the X-ray to first discover the true lesion.

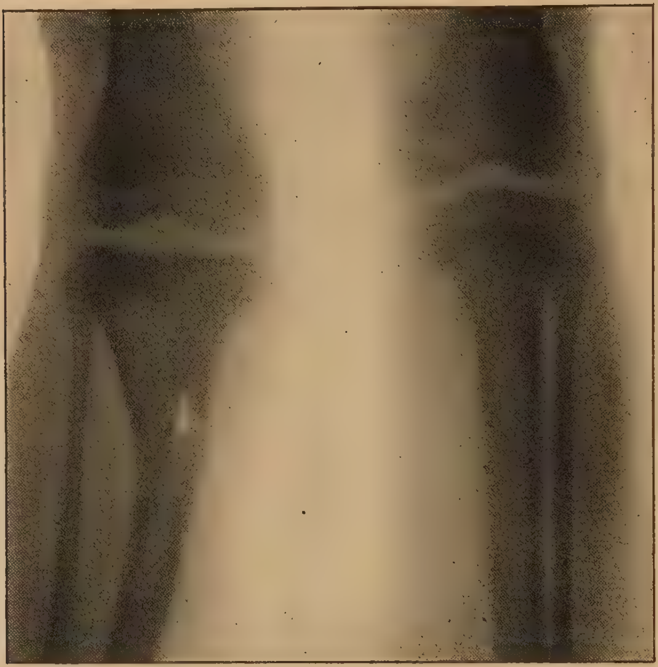

FIG. 10.—SAME CASE AS FIG. 8, TAKEN TWO YEARS LATER. Sequestrum has been removed. Excellent functional result. Sinuses all closed.

4. We meet more rarely a type of chronic diffuse osteomyelitis. (See Fig. 12.)

The diagnosis clinically is often difficult, and from the X-ray the diagnosis may be still in doubt between osteosarcoma and osteomyelitis.

The man had had six years of trouble with many operations, but no pus had ever been found. It was a chronic process without any successful attempt at repair, and with involvement of the whole shaft. An operation was performed and a positive diagnosis of osteomyelitis without evidence of malignant process was made by the microscope.

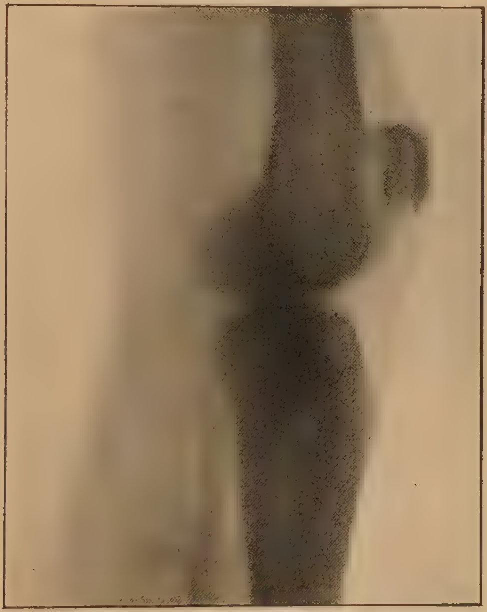

FIG. 11.—CHRONIC CIRCUMSCRIBED OSTEOMYELITIS.
Rather obscure cavity containing a sequestrum and surrounded by dense bone in upper part of tibia. Joint surfaces clear.

The end result of an osteomyelitis near the hip joint may be interesting on account of its contrast with tuberculosis. (See Fig. 13.)

ATROPHIC AND HYPERTROPHIC ARTHRITIS.

There are certain conditions concerning which there has been much confusion of terms. They have been classed under the one head of arthritis deformans, and are considered especially by the English school to represent different stages of the same disease. In America many of our best observers regard them as separate.

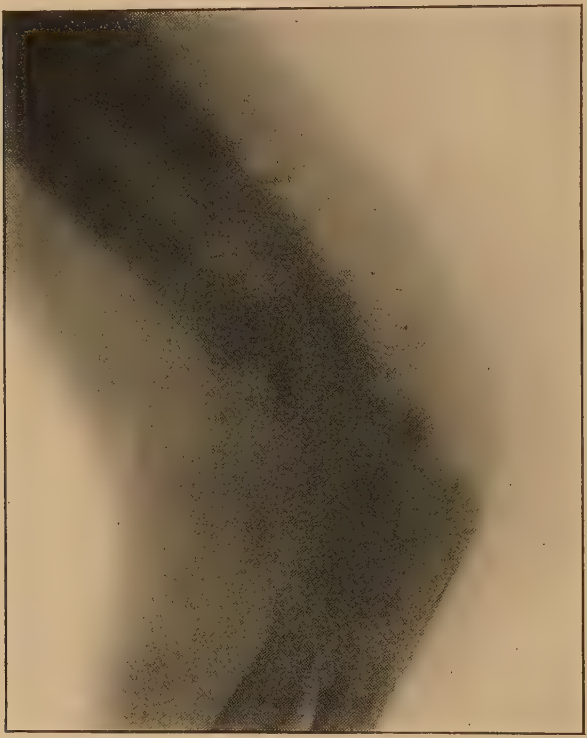

FIG. 12.—DIFFUSE CHRONIC OSTEOMYELITIS.
X-ray picture resembles in many ways a malignant process.

From an X-ray point of view the so-called atrophic or rheumatoid arthritis and hypertrophic or osteoarthritis are usually from the earliest manifestations distinct and separate conditions and disregarding clinical differences of opinion can be regarded as such.

One represents atrophy; atrophic arthritis.

The other hypertrophy; hypertrophic arthritis.

One a destruction of cartilage and a loss of substance.

The other thickening of cartilage and the deposition of lime salts and actual new bony outgrowth.

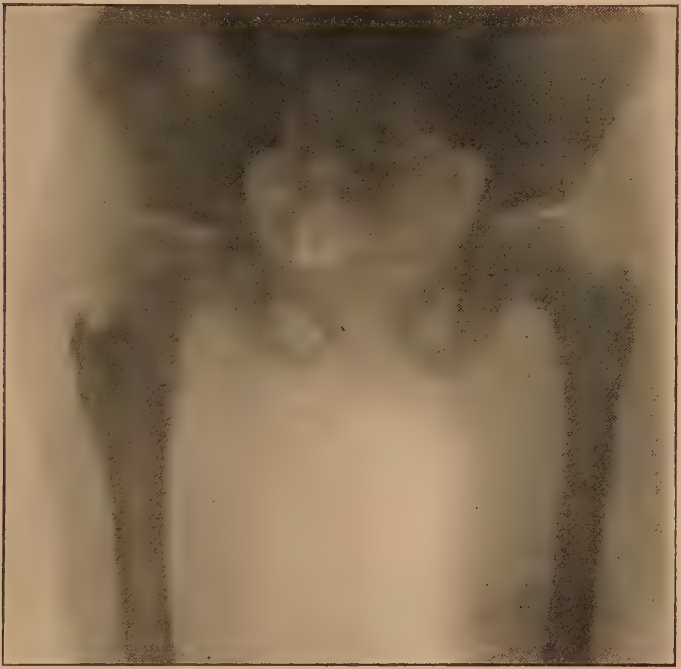

Fig. 13.—End Result of an Osteomyelitis of the Great Trochanter and Femoral Neck.

Practically no bone atrophy of structure or size. See Fig. 5.

Watched from the onset of the first symptoms the two diseases seem to differ essentially. One is occasionally superimposed upon the other just as scarlet fever may be accompanied by diphtheria. In these rather unusual cases the patients themselves will often recognize them as distinct processes.

The interpretation of the negatives in suspected or pronounced cases of these diseases is interesting and not difficult.

With slight explanation the condition is evident to the patient and satisfies him in regard to a vague joint condition, and to the physician it means more accurate diagnosis and more information as to prognosis.

The figures will show the contrast and perhaps need little description. (See Figs. 14, 15, 16 and 17.)

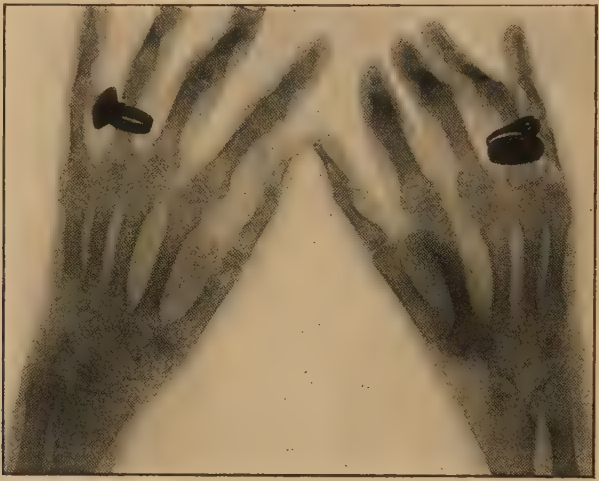

Fig. 14.—Atrophic Arthritis.

Lesions most evident in midphalangeal joints and wrists. Destruction of articular cartilage and subluxations in the fingers. Atrophy of bone structure well shown by comparatively faint bone shadow in comparison with soft parts.

Infectious Arthritis.

We are finding an increasingly large number of joint lesions, single and multiple, which are unquestionably due to some toxin or true bacterial infection. To these has been given the name of infectious arthritis. (See Fig. 18.) Under this head it seems possible to group many of the cases of so-called acute articular rheumatism.

The acute joints following a Nisser infection are a striking example of this type.

We think it is possible to distinguish these by the X-rays as well as clinically; indeed, when the clinical diagnosis is in doubt the skiagraph is often conclusive.

The joint lesion in the active stage represents neither essential atrophy nor hypertrophy of bone structures. The capsule is thickened and infiltrated, with or without excess of fluid in the joint, but with no erosion of joint surfaces in the early stages. The X-ray would suggest that the so-called Still's disease represents an identical or certainly analogous process, in which recovery with practically no limitation of motion is possible. (See Figs. 19 and 20.)

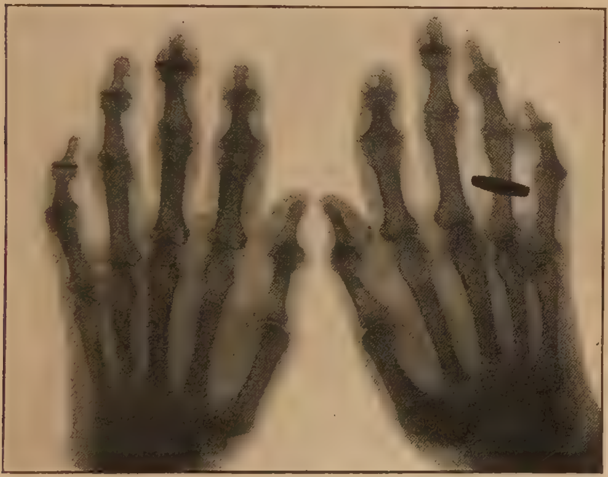

FIG. 15.—HYPERTROPHIC ARTHRITIS WITH HEBERDEN'S NODES. Marked overgrowth of bone at the distal ends of the second and third phalanges. In places thickening of capsules and ossification of ligaments beginning. Joint lines can be made out. Bones dense and structure not atrophied.

True gout seems to be in a class by itself. The tophi scarcely show in the negative, but the loss of substance of the shafts of the bones as well as the erosion of the joint surfaces is, in the advanced stage, characteristic.

A Method of Technic.

Your consideration is asked for a method of obtaining satisfactory skiagraphs of deep bony structures, especially of the lumbar spine, the sacroiliac synchondroses, and the hip joints.

Rigidity of the lumbar spine is by no means an uncommon symptom. In a surprisingly large number of the adult cases the diagnosis cannot be made at the first examination, or even after repeated observations. Frequently it must be withheld until reaction to treatment is known, and not seldom when made, is shown to have been wrong by the subsequent history of the case.

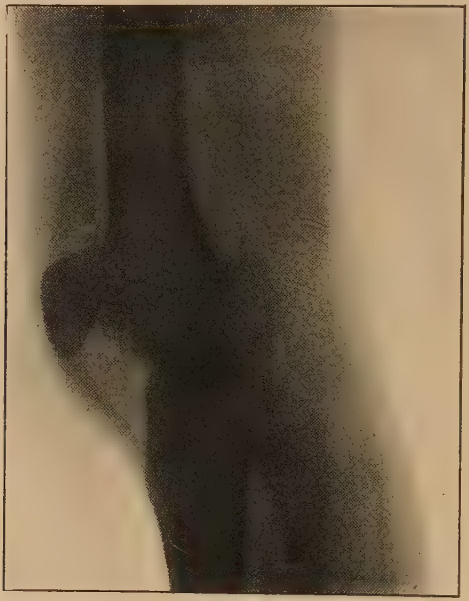

Fig. 16.—Atrophic Arthritis of Knee.

Partial subluxation of tibia with destruction of articular cartilage between femur and tibia. Strong shadow cast by the soft parts, especially the tendons, in comparison to the bone shadow, indicating bone atrophy. See Fig. 17.

A Pott's disease without evident knuckle, as osteoarthritis or osteomyelitis, an infection of the retroperitoneal glands, may give rise to physical signs which at times resemble each other too closely for conservative definite diagnosis.

There is a place, therefore, for a method which makes possible earlier and more accurate diagnosis of lesions in this region.

Skiagraphy would seem to offer this opportunity, but a poor skiagraph of the spine is really worse than useless, and poor skiagraphs have been the only ones constantly obtainable.

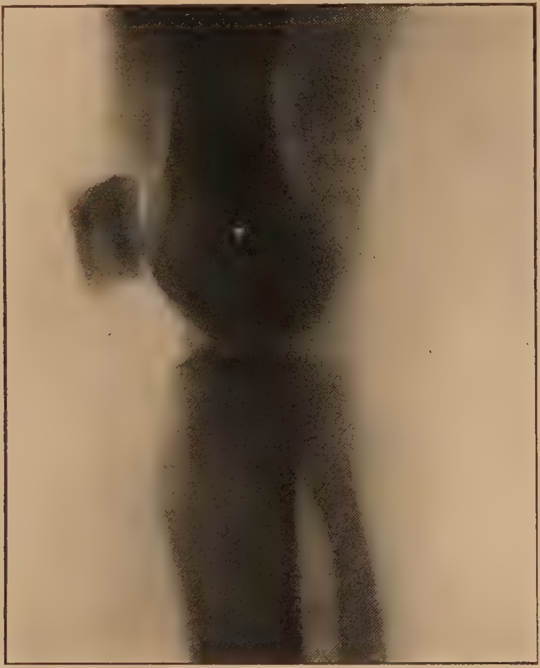

FIG. 17.—HYPERTROPHIC ARTHRITIS OF KNEE.

No subluxation, clear line between femur and tibia showing no destruction of cartilage. Overgrowths of bone seen on patella and articular surface of tibia. Strong shadow of bones compared with soft parts.

To the Germans, and I think to Dr. Albers Schönberg, of Hamburg, belong the credit of devising a method of obtaining clear skiagraphs of small areas of deep lying bone.

The difficulty of getting a clear shadow of the spine lies in the fact that between the tube and spongy bones of little density there is interposed a heavy layer of abdominal muscles and masses of intestines often filled with solid or fluid contents. These obstructions to the passage of the rays are not only often of nearly the same X-ray density as the bones themselves, but are interposed well above the bones, nearer the tube, and act as diffusers of the rays.

It is well known that there emanate from an active Crookes's tube not only the actinic rays projected from the point of focus on the plane of the anode, but also other secondary rays, *less* but definitely actinic also, with the power, therefore, of affecting a photographic plate. In taking a skiagraph of a spine which requires a relatively long exposure, these secondary rays obscure the clear shadows of bone outlines, and to a certain extent actually fog the plate.

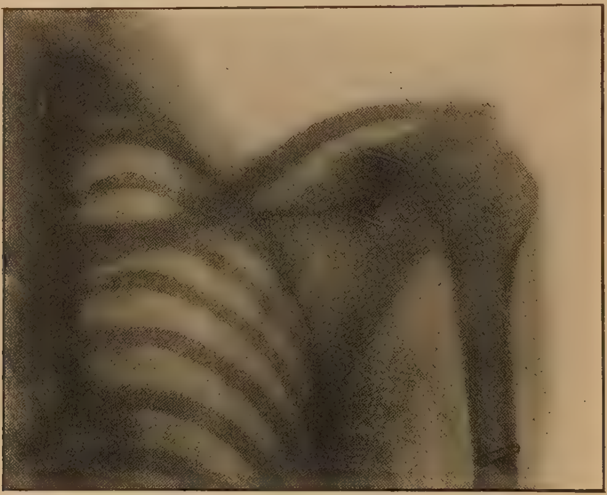

FIG. 18.—INFECTIOUS ARTHRITIS OF SHOULDER.
Ankylosis of joint from adhesions and periarthritis. No marked atrophy or hypertrophy. Outline of joint surfaces clear.

The compression screens of Albers Schönberg, Dessauer, and others largely obviate these difficulties, where a view of a limited area is all that is required. With the knees drawn up, and preferably with the bowels emptied, a tube or ring of material impervious to the X-rays is placed, for example, on the patient's abdomen, and by one means or another pressed downward to the extent of tolerance of the patient. (See Fig. 21.) The intestines are thus pushed aside and the distance between the superior surface of the abdomen and the spine materially lessened.

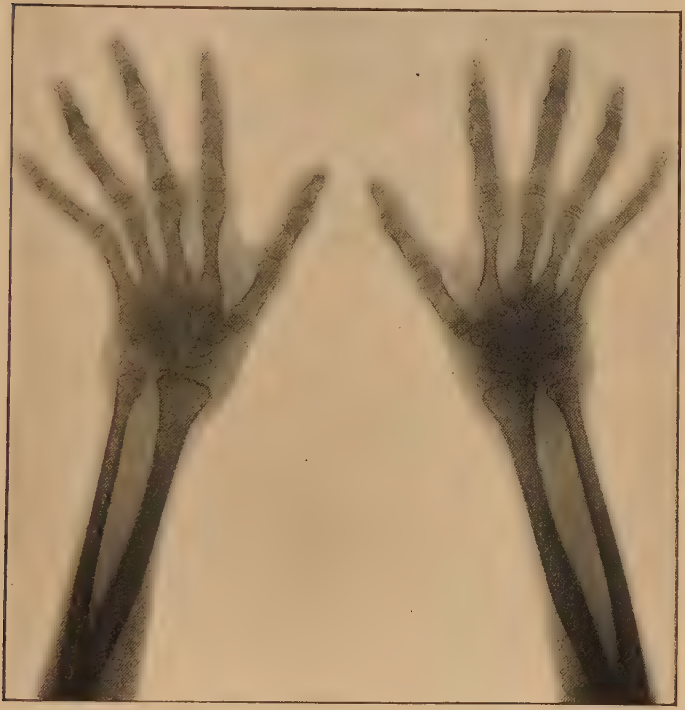

FIG. 19.—INFECTIOUS ARTHRITIS, ACTIVE STAGE.
Marked periarticular swelling. No essential atrophy or hypertrophy. No involvement of joint surfaces. See Fig. 20.

The plate is placed beneath the patient in proper position the Crookes's tube a suitable distance above, and a lead screen with a diaphragm in the center between the light and the upper opening of the tube. We have thus the respiration rendered entirely thoracic, all the anode rays concentrated on the area observed, and the secondary or fogging rays cut off by the lead screw.

The details of apparatus need occupy little attention. The only German one which I have seen had certain disadvantages of application and expense, and the area radiographed was very small. The writer's apparatus is not offered as being in any way an ideal one. Its merits are its cheapness and simplicity, with the possibility of including satisfactorily larger areas than I have seen in the German work. The lower opening of the tube may be easily changed from a circle to an ellipse by manually compressing the cone seen in the plate.

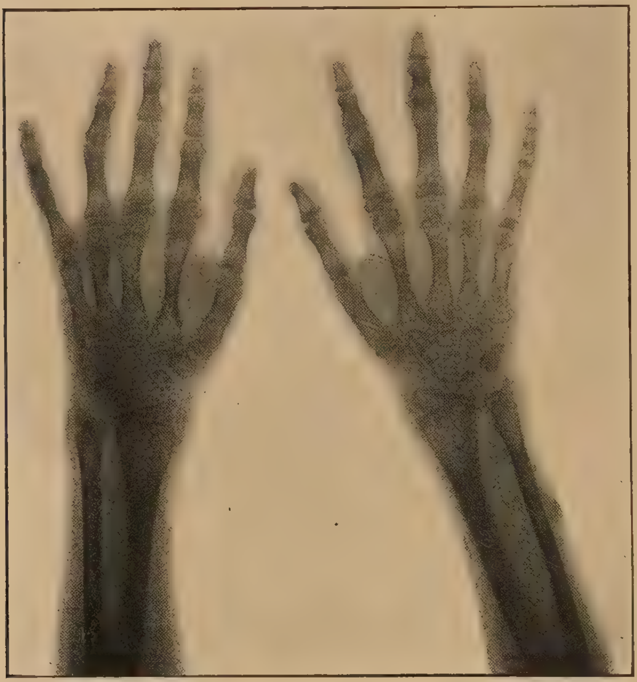

FIG. 20.—SAME CASE AS FIG. 19, TAKEN ONE YEAR LATER.
Periarticular process has largely subsided. Joint surfaces remain uninvolved.

Given skiagraphs which show bone structure, the problem is now to correctly interpret these plates. With a process which gives fairly constant results this correct interpretation should be possible to acquire. (See Figs. 22, 23 and 24.)

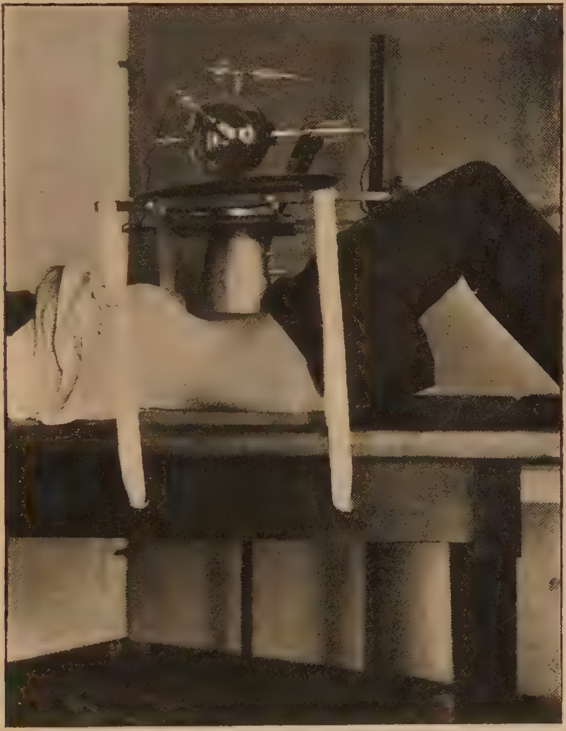

FIG. 21.—SINGLE COMPRESSION APPARATUS IN PLACE.
Crookes's tube focussed over diaphragm in lead screen. Compression cone held in place by frame strapped to screw eyes in table. Plate beneath the patient.

The limits of this paper have forbidden the consideration of many conditions which might properly be classed as orthopedic pathology, especially the different forms of specific bone lesion, which are most interesting and most varied, and the striking and characteristic appearances of Paget's disease, or osteitis deformans. We are beginning to recognize in these diseases a means of studying them which promises to throw light on hitherto obscure pathological processes. Its possibilities are here merely suggested. As we become more proficient in technic and more experienced in knowledge of the normal, we may hope to find similar advantages in other conditions, and to recognize the pathologic process earlier, with greater constancy, and with greater accuracy.

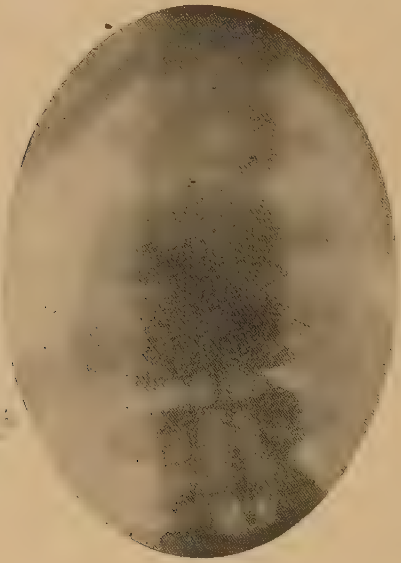

FIG. 22.—LUMBAR SPINE OF HEAVY MUSCULAR MAN.
Lesion of second and third vertebræ evident. Exposure ninety seconds with compression screen. Tube twenty inches from plate.

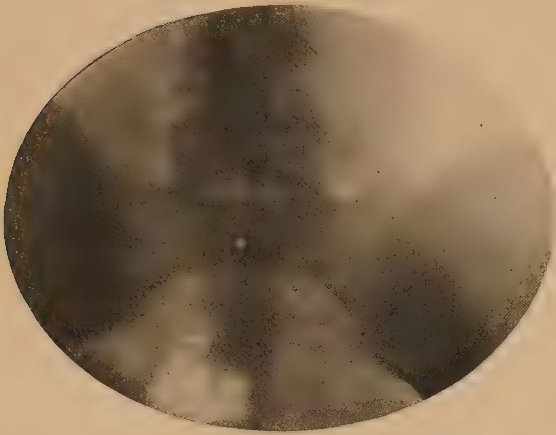

FIG. 23.—NORMAL SACRO-ILIAC SYNCHONDROSES AND LOWER SPINE. Woman of medium weight. Exposure ninety seconds with compression screen. Tube about twenty inches from plate.

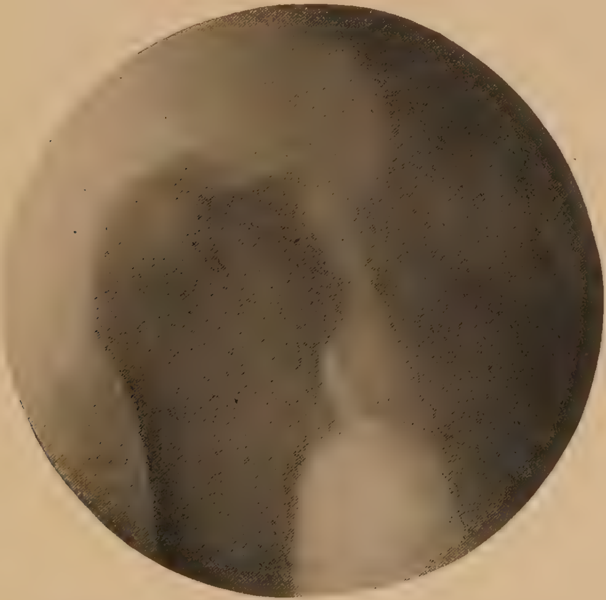

FIG. 24.—INTRACAPSULAR FRACTURE OF HIP JOINT. Very heavy woman. Exposure two minutes with compression screen. Distance of tube from plate twenty-four inches.

XII.

SAYRE'S WIRE CUIRASS.

ANSEL G. COOK, M.D., HARTFORD, CONN.

The wire cuirass here described has been used by me constantly for the past twelve years. It is mounted on a frame with high wheels. The legs of the cuirass are hinged and pivoted so that they can be fixed at any angle. The original Sayre's cuirass, with these modifications or additions, I have found to be the most useful, convenient and often the only efficient apparatus for treating certain fractures of the femur, acute inflammation of the hip-joint, spine, etc. It is particularly valuable in the treatment of young children where absolute fixation is imperative.

Many braces, splints and special apparatus have been invented and advocated, from time to time, to give rest and fixation to the spine, or to one or both hips, to make extension in the line of the deformity for injury or disease of the hip joints, to hold the broken ends of a femur fractured in the upper third when it is impossible to depress the upper fragment, to hold the patient securely when he is young and inclined to wriggle out of all dressings, to keep the patient absolutely still in one position and clean and dry, and to avoid the disturbance caused by evacuation of the bowels and voiding urine.

All these things the cuirass does and the patient is perfectly comfortable, having even a table to eat his dinner on or to play games, and a book rest. He can be taken from one room to another, out of doors, or even from Boston to San Francisco without interrupting treatment.

Not only is the cuirass serviceable in a hospital ward but it is particularly valuable in private practice. It stands neatly

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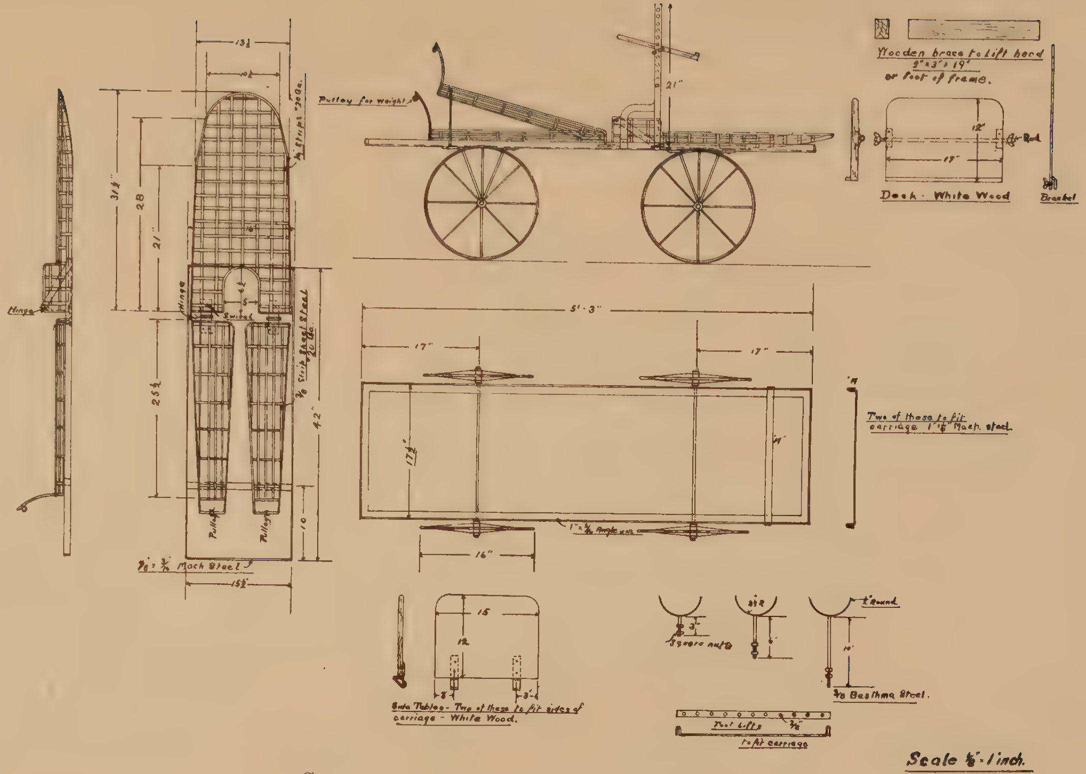
Presented at the Eighteenth Annual Meeting of the Association, at Atlantic City, N. J., June 8–10, 1904.


13½
10
½ Strips 20 Ga.
31½
28
21"
16
4½
5
Hinge
Swivel
⅜ Strip Sheet Steel 20 Ga.
25½
42
10
Pulley
Pulley
⅜ x ¾ Mach Steel
15½
Hinge
Pulley for weights
21"
Wooden brace to lift head
2" x 3" x 19"
or foot of frame.
12"
Rod
19"
Desk · White Wood
Bracket
5'-3"
17"
17"
17½"
14"
Two of these to fit
carriage 1" x ⅛" Mach. steel.
1" x ⅛ Angle iron
16"
15
12
3"
3"
Side Tables - Two of these to fit sides of
carriage - White Wood.
3"
Square nuts
3½
1" Round
10"
⅜ Bessemer Steel.
Foot Lifts
⅜"
to fit carriage
Scale ⅛"-1 inch.

Sectional View of Sayre's Wire Cuirass.

packed in some obscure corner of the office ready for instant use. It can be sent to the house of a patient in town or in the country and when the surgeon arrives, he has everything he can possibly want; he does not have to improvise things or send for things. The patient has the comforts of home, the advantage of out door air and is as well off, mechanically, as he could be in the best equipped orthopedic hospital in the country.

It is true, at the first glance, the cuirass looks elaborate and expensive, but it is really very simple, and when it is remembered that the cuirass can be used over and over again indefinitely, the initial cost is not of much importance. I have six of these cuirasses in constant use, I paint them red and yellow, call them automobiles and my little patients ride out in them to their great satisfaction and enjoyment.

One little fellow, aged nine, has a double hip-joint disease and is in severe pain when the weight is less than six pounds on each leg, but he is absolutely comfortable on his "auto" and is as brown as an Indian. He rides out daily, visits his little friends, gives and receives parties, has been to two weddings and expects to go to school on it next month.

XIII.

A CONSIDERATION OF THE TREATMENT OF FLEXIBLE FLAT FOOT.

E. H. BRADFORD, M.D., BOSTON.

The subject of the treatment of flat foot is more easily comprehended if the sole of an undistorted normal foot be examined. It will be seen that the weight-bearing portion of the sole of the foot can be divided into three regions; one at the heel, passing forward somewhat obliquely to the outer side; another under the so-called ball of the foot including also the great toe; a third extending along the outer portion of the sole from behind the little toe toward the heel. The foot may be considered, if the expression may be allowed, an irregular tripod the parts acting together to support a superimposed weight. It is manifest that if any of the points of support are weakened the weight will fall in that direction and the strain be increased accordingly. The function at the heel is to sustain the direct weight of the body when the individual is standing, and the two anterior portions serve to check any inclination of the weight as it falls to the outer or inner side. The region of support already indicated becomes continuous, under the pressure of superimposed weight, so as to form apparently an irregular curve passing from the heel to the ball of the great toe along the outer border of the foot. If, however, the skin, fat and muscles are removed from the foot, and the bones as united by ligaments are seen, it will be found that the weight-bearing portion of the foot consists chiefly of the end of the os calcis and the heads of the metatarsals, especially the first and fifth, with the underlying tissues as cushions. The foot being flexible, under the strain of superimposed weight, is flattened to a degree and a certain amount of weight is borne on other portions of

Presented at the Eighteenth Annual Meeting of the Association, Atlantic City, N. J., June 8–10, 1904.

the foot, *viz.*, the heads of all the metatarsals and on the proximal end of the fifth metatarsal, as well as the greater part of the shaft.

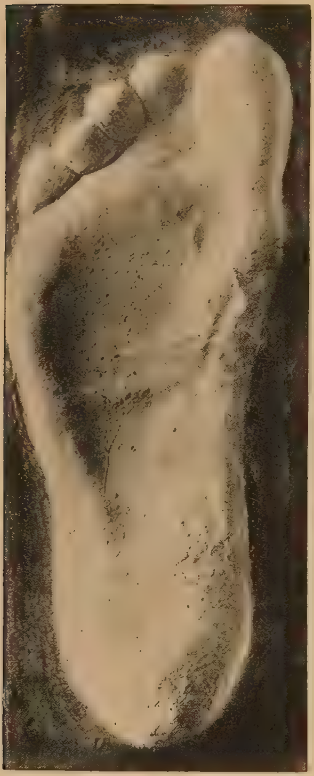
The greater part of the weight-bearing surface is on the outer side of the foot, and the foot, when bearing weight, would roll to the inner side if it were not for the strong pressure from that portion of the tripod which is on the inside, *i. e.*, the first metatarsal. It is for this reason that there is a considerable motion possible at the metatarso-cuneiform articulation of the first metatarsal. This motion is both a side and an up-and-down motion. The motion at the medio-tarsal articulation also permits pushing the astragalus to the outside by the action of the first metatarsal. Inclining the body to the outer side in the side swing, which may take place at certain stages of gait, shifts the weight as it falls upon the foot and limits the rolling in of the foot at the ankle. But where this does not take place the prevention of the inward drop of the tarsus is only effected by means of what may be termed the truss action of the first metatarsal. The head of the latter is pressed firmly upon the ground; the shaft, being held firmly by muscular action, checks the inward and downward motion of the midtarsal bones, scaphoid and astragalus by pressure on the cuneiform.

The danger of the falling of the superimposed weight too far to the inner side of the median line is not great in strong feet or in feet not having to support great superimposed weight. The natural support given by the muscles, ligaments and bones is sufficient to adjust itself to the shifting load as it occurs in various stages of locomotion. The condition, however, is different if for any reason the foot has been weakened and either of the parts of the tripod is unequal to resist the strain placed upon it. Where this is the case, if the foot is examined it will be seen that the portion of the sole which shows contact with the ground is broader than normal.

Structural changes are developed making either weak or flat feet, according to the amount of rigidity and the extent of the distortion. An examination will show that these variations from normal vary in different feet according either to the different strain placed upon them or according to the amount of resistance of the different parts. In some instances the distortion is limited largely to that of the first metatarso-phalangeal articulation, and the deformity known as hallux valgus is that which weakens the support of that portion of the foot. In others a condition which may be termed metatarso-tarsal valgus exists, there being not only a limit to the power with which the first metatarsal can swing to the side and support the strain, but an actual valgus at that portion of the foot. More commonly the valgus takes place at the medio-tarsal articulation and the tarsus is swung to the inside giving the concavity in the outline of the outer portion of the foot. In some instances the shape of the front of the foot may be sufficiently well preserved, but there is a weakening of the ligaments holding the os calcis which swings slightly to the side. More weight is thrown on the proximal end of the fifth metatarsal, or, in extreme cases, weight comes even on the first cuneiform and the scaphoid, and the condition of pronounced flat foot has been developed with structural changes of ligaments and irritation changes in bone. In the most extreme cases weight falls on the anterior portion of the os calcis which, instead of pointing towards the outer side of the foot, is under the middle of the foot, the front of the foot being swung to the outer side.

It is manifest that where variations in flat foot exist, the shape of the plate, if a plate is used, must vary according to whether the purpose of the plate is to prevent an inward twist of the os calcis, to prevent the dropping of the sustentaculum tali and the corresponding astragalus and cuneiform, or to favor the inward rotation of the front of the medio-tarsal articulation or of the first metatarsal in front of the cuneiform.

The examination of the foot to determine these various changes is not difficult. It can be done by palpation aided by skiagrams taken both in the vertical and in the transverse direction. These, however, give representations of the foot as it is when at rest. It is advisable to examine the foot also when in action and to watch the gait. The smoked paper imprint gives the impression of the foot when bearing weight, as is also the case with mirror observations, but for an examination of the foot in walking the following simple device will be found of use. If the soles of the feet are covered well with talcum and the patient made to walk upon a linoleum covered, or a hard wood, floor, the angle of deviation of the feet, the amount of variation in the position of the os calcis and the flatness of the arch can in walking be well determined. In order to obtain evidence as to the variation in the pressure-points of the different parts of the foot the following device is possible. A pan filled with sand to the depth of three inches is covered with cotton cloth and over this is placed a sheet of dental wax, made by rolling dental wax to a sufficient size to include the whole of the foot. This wax previously softened in hot water is laid upon the cotton covering the sand. The patient walks across the floor and steps with the foot not to be examined upon a block of equal thickness as the sand-filled pan, and with a natural gait walks upon the softened wax. The bottom of the foot should be moistened in order not to adhere to the wax. The wax is examined as soon as it becomes hard and the pressure-points of the different bones of the foot will be seen. A plate can be modeled from this impression or a piece of dental wax softened can be molded upon the foot in a corrected position. This gives the surgeon an opportunity not only to adapt the wax plate to the foot but also to the shoe,



Plaster Cast of a Dental-wax Impression of Footprint on Sand, showing Weight Portions of Foot.

and to alter the plate in such a way as to exert pressure under any bone that he may desire. A plaster cast is taken from the dental wax mould and the plate made in the usual way. It is of course important that the plate should not only fit the foot and meet the surgical requirements but also fit into the shoe and not slip under the foot in such a way that the weight-supporting action of the plate is impaired. A certain amount of skill is necessary for this purpose as well as experience and judgment in the shape of the plate to be used. The plate which will hold up the sustentaculum tali may not answer to support the first metatarsal. A plate supporting the first metatarsal may not be able to support properly a foot suffering from mediotarsal valgus or a metatarso-tarsal valgus or a malposition of the os calcis. It is evident also that where great stiffness is present the shape of the plate will differ from that needed when the foot is a flexible one, and it is also true that where the cuneiform and scaphoid are not covered by an adequate layer of fat, pressure of a plate upon these bones will be painful.

General rules are necessary for all plates obtained in the resistant as in the flexible feet, namely, that the purpose of the plate should be to support the foot in a corrected position, employing the superimposed weight of the individual as the force and the shape of the plate as the means of directing the pressure. Ordinarily the portion of the foot which needs the most pressure is underneath the sustentaculum tali and in the region directly anterior. But the rest of the plate should be shaped so that the midtarsus will be pressed to the outside. As has already been said, variations according to the special need of support under the head of the first metatarsal, or under the length of the second metatarsal in cases of flattened transverse arch will be needed. Where there is a great inclination of the os calcis to fall to the inside, it is necessary to raise the whole length of the inner edge of the os calcis, and where the sustentaculum tali drops to the inside to a large extent a greater amount of support must be placed under this bone than is sometimes necessary, and the breadth of the plate must vary correspondingly. Where the condition exists in which too great an amount of weight falls upon the inner side of the foot, a longer plate is necessary than where this distortion is less prominent, but it is always important that the head of the first metatarsal should press firmly upon the ground. In some cases it is necessary to correct a hallux valgus which can be arranged by a prolongation of the plate or by the use of an inter-toe post. In the severer forms of the distortion where it is necessary to force the sustentaculum tali largely to the outside, pressure on the outer side of the plate is necessary in order to prevent the foot from slipping away from the plate This pressure can be exerted at the tip of the os calcis and also on the fifth metatarsal bone in front of its projecting proximal end. Side pressure from the plate on the inner side of the foot, just below the prominence of the astragalus, is sometimes needed.

Plates as ordinarily made are intended to exert pressure when the patient is standing, but manifestly this is utilizing but a portion of the possible means of correction. If it is remembered that the position of the foot in walking in the various stages of the step are almost as influential as the attitude in standing in the production of flat foot, it will be seen that great good can be obtained by employing means which will direct the position of the foot in walking. In the normal step the foot is brought forward striking the ground at the heel. Weight is then thrown normally upon the outer edge of the foot, and is later brought upon the ball of the foot from the outer to the inner portion of the foot when the head of the first metatarsal and the great toe are brought to the ground. The body is then poised with the weight upon the ground, the toes being brought to the ground. The other foot is then brought forward and as weight is brought upon that the push comes from the rear foot, the heel being raised and the front of the foot and the toes exerting pressure to propel the body forward. It is evident that the angle at which the foot strikes the ground will modify the subsequent strain upon the ligaments. If the moving foot is brought forward in the line of motion the strain at the mediotarsal articulation will be small. If, however, the foot when brought forward is turned out, greater strain will be brought on the inner portion when the foot is placed upon the ground. Variations in the strain come also as the individual makes greater use of the front of the foot or the heel in walking. Heel walkers do not strain the front of the foot as much as those who push forward actively with the front of the foot. Whether plates are worn or not it is evident that unless the individual places the foot in a way that the plates can exert a proper pressure, the service of the plates is limited. It is manifest that if the individual strikes the ground more with the inner side of the heel than with the outer, the outer border of the sole will be brought to the ground less readily. The inclination of the foot outward as the heel strikes the ground is also an important factor in the weight-bearing function of the foot as the body comes over the foot. It is for this reason that in weak-footed individuals it is desirable that an arrangement should be made so that the inner edge of the os calcis should not bear more heavily upon the ground than the outer. This can be done artificially by raising the inner edge of the heel of the shoe, and also by not only raising the inner side of the shoe, but by dropping the outer edge of the shoe, making a considerable difference. It will be found that it is desirable, in order to effect this, that there should be a difference, from one-quarter to three-quarters of an inch, in the height of the heel. This can also be done and quite effectively by placing pads inside of the shoe so as to exert pressure under the inner edge of the os calcis. If these pads are brought forward and are sufficiently high to press along the inner side of the os calcis, the inward twist of the front end of the os calcis will be prevented and that portion of a valgus obviated.

The heel can be brought forward on the inner side so as to press well up under the sustentaculum tali, but the raising of the whole inner edge of the sole, though useful temporarily in badly distorted feet, is not advisable in slightly distorted flexible feet, as it interferes with the normal action of the front of the foot.

The need of development of the muscles of the front of the foot, and of the leg and thigh, and the measures to effect this, the methods of correction of the distortion and the nature of the distortion and structural changes in rigid flat foot are not considered in the present paper, which is intended to call attention to the need of investigating the functional flexibility of the foot in the treatment of flat foot as compared to the normal flexibility.

ABSTRACTS.

MUSCLES AND TENDONS.

362.—Tendon Lengthening and the Use of a Section in Three Steps. By v. Hacker. *Arch. f. Orthopaedie,* Band II, Heft 3.

The endeavor to preserve the continuity of the tendon undergoing lengthening is useless, and the various methods devised have been supplanted by division of the tendon. Among the latter methods Bayer's Z incision has proved the most valuable and has been most universally adopted both for open and for subcutaneous tenotomies. Various modifications have been advocated; that of v. Hacker consists in making the zigzag in three equal steps, the first and third of which are sutured together. By this method both the longitudinal and transverse surfaces of the tendon are brought into apposition and the resulting lengthened tendon is two-thirds the size of the original. This method can also be used to shorten tendons and to shift their insertion.—*Walter G. Stern, Cleveland.*

363.—A Practical Method of Tendon Suture. By Suter. *Langenbeck's Archiv.,* Bd. LXXII, Heft 3; reviewed in *Arch. f. Orthopaedie,* Band II, Heft 3.

The chief requisite of a good tendon suture is its ability to withstand strong tension immediately after the operation without pulling through. To do this it must be fashioned so that a longitudinal pull in the tendon is converted into a circular compression from the suture. Suter advocates a modified Wölfler or Trnka suture.—*Walter G. Stern, Cleveland.*

364.—Osteal Tendon Transplantation. By Chlumsky. *Arch. f. Orthopaedie,* Band II, Heft 3.

Chlumsky calls attention to the insecurity of the usual methods of inserting transplanted tendons. No ordinary method is secure enough; he splits the tendon longitudinally and draws one part through a channel drilled through the bone and ties it to the other half.—*Walter G. Stern, Cleveland.*

365.—The Causation of Muscular Wry-neck. By F. Kempf, Hanover *Deuts. Zeit. f. Chir.,* Vol. LXXIII, Nos. 4–5, June, 1904.

The quite extended discussion relative to the etiology may be summed up as follows: The histologic findings in the sterno-cleido-mastoid muscles of these cases do not confirm the existence of the inflammatory origin of the disease. The findings point more toward an ischemic origin. The sterno-cleido-mastoid muscle on account of its exposed position and the peculiar distribution of its blood-vessels offers very favorable conditions for the existence of this ischemia. In some cases trophoneurotic processes can augment the action of the ischemia. The indurations of the sterno-cleido-mastoid anatomically considered are easily comparable with the results of a hemorrhagic infarct. These indurations can disappear without leaving any marked changes in the tissues, but can also induce the ischemic contracture. Ischemic-neuropathic causes affect the sterno-cleido-mastoid during intra-uterine, intra-partum, and post-partum existence.

As far as predisposing causes are concerned it was found that there were thirteen male and twenty-four females among the patients. Dystocia did not seem to be a factor.

The operation used resolves itself into the following procedure. Under chloroform a 4 cm. cut is made through the skin and platysma parallel and directly above the clavicle at its sternal end. The clavicular and sternal portions of the stretched sterno-cleido-mastoid are cut close to their insertion as is also any contracted posterior portion of the muscle sheath which can easily be felt with the finger while the head is being corrected. Forcible bending of the neck, such as is practised by Lorenz in his forcible redressment, was never used. After a week when the skin incision is firmly healed the patient returns and the mechanical after-treatment is shown to the parents. This consists in fixation of the shoulder of the diseased side, while another person bends the head toward the opposite shoulder and rotates the head so that the chin points toward the diseased side.

The results have been uniformly good in the twenty-three cases upon which it was tried. A detailed account of these twenty-three cases, and nine cases which are no longer under observation, and five recently operated cases concludes the thorough article.—*Carl Hiller, Cincinnati.*

BOOK REVIEW

366.—Chirurgie Orthopedique. By Berger and Banzet. Paris, G. Steinheil, 1904. Large 8vo, 624 pages with 489 figures.

This work is a part ot the *Traité de Médecine Operatoire et de Thérapeutique Chirurgicale*, published under the direction of Berger and Hartmann. It is accordingly a work devoted entirely to treatment and in which all questions of pathology, symptomatology and diagnosis are omitted. Within this limitation, the work is practical, for the most part, clear and up to date. Its perusal will at once show that it is addressed chiefly to the surgical specialist and to him it must prove to be a valuable manual of orthopedic therapeutics. Not being a work for the medical student, or for that matter for the general practitioner, the paucity of bibliographic references is a regrettable feature. As is so frequently the case with Continental treatises, there is no index but, instead, a bulky table of contents and a long list of illustrations which might profitably have been omitted.

The German, English and American literature is freely referred to, but not always carefully and with discrimination. For example, Bradford's club-foot lever is credited to H. O. Thomas; Grattan's and Lorenz's osteoclasts are not mentioned; Lorenz's operation for the bloodless replacement of congenital luxation is described in detail, but no mention is found of Hoffa's maneuver which is by many considered equally effective and accompanied by much less danger.

One looks in vain for chapters devoted to the treatment of spondylitis and coxitis. The former is omitted altogether; the latter is treated only with regard to the deformity or ankylosis which it has produced and without considering the means of preventing or modifying them during the activity of the disease. These are chapters far more strictly orthopedic and also far more important than certain others which have found detailed treatment.

The chapters on scoliosis are very good and treat the subject in an extensive manner. The importance of gymnastic methods and the achievements in the line of mechanotherapy are set forth at length. This is possibly the best part of the work.

Much attention is bestowed upon the details of bloody operations, such as plastic operations for the cure of cicatricial contractions and the various joint resections, while practically no space is devoted to the technic of strictly orthopedic apparatus. This appears to be a matter left by the authors to the surgical instrument maker.

The tenoplastic procedures for paralytic deformities are treated at length and some of the illustrations are very instructive and original. The periosteal and osteal implantations are, however, not described and Lange's method of forming the silk tendon is not found mentioned.

While the text contains much that is of interest and instruction to the orthopedic surgeon, it contains remarkably little that is original with the authors and falls very short of *completeness* as a manual of orthopedic therapy. It strikes one as the product of general surgeons who do much orthopedic work, rather than as coming from men whose chief concerns are orthopedic and with whom general surgical questions are of secondary importance.—*Albert H. Freiberg, Cincinnati.*

SPINE

367.—**Syphilitic Spondylitis.** By Froehlich. *Presse Médicale*, 1904, No. 46; review *Münch. med. Woch.*, Oct. 26, 1904, p. 1935.

Froehlich had two cases which he differentiated from tubercular Pott's disease by the smallness of the tumor (in the cervical region), the intermittency of the pains, and the absence of any kyphosis. Orthopedic treatment and the free exhibition of potassium iodide and hydrargyrum cured the cases in a comparatively short time.—*Walter G. Stern, Cleveland.*

368.—**Later Course of Spondylitis.** By A. Hugelshofer. Abstract from *Jour. Am. Med. Assoc.*, Feb. 18, 1905.

Hugelshofer observed abscesses in two-fifths of the cases of spondylitis at the Children's Hospital at Basle. There was paralysis later in 10 per cent. As this occurs predominantly in cervical spondylitis, and as two-thirds of the cases terminated fatally, this must be regarded as the most dangerous type. Amyloid degeneration occurred in about one-tenth, and tubercular complications in two-fifths of all the cases. Complete recovery was attained in only 31.3 per cent. The definite results were satisfactory so far as function was concerned, but the deformity persisted. His material includes 215 children with tuberculous spondylitis, but the final outcome could be learned only in 68. He gives the history and findings in 35 patients whom he personally examined many years after their treatment in the hospital.—*R. B. Osgood, Boston.*

369.—**The Frequency of Ankylotic Spondylitis.** By Lorenz. *Wien. med. Woch.*, 1904, No. 38.

Lorenz examined 677 patients in the Friedrichstädter Hospital and found in 168 (24.8 per cent.) some form of inhibition of the normal motions of the spine, 33 of these being very marked ankylosis.

This condition came on at all ages above eighteen; but three-fourths occurred after the age of forty-five.

Etiology.—Rickets seemed to have had no causative relationship; 10 per cent. had previously had articular rheumatism; 40.5 per cent. had pulmonary tuberculosis, while 55 per cent. of all the cases of stiffening of the spine under the age of forty-five had pulmonary tuberculosis. No explanation is offered for this relationship.—*Walter G. Stern, Cleveland.*

370.—**Notes on the Treatment of Torticollis.** By G. Hohmann. Munich. *Zeit. f. orth. Chir.*, Bd. XIII, Heft 1.

After reviewing the usual methods of operation Hohmann describes the operation of Lange. The sterno-cleido-mastoid is divided at its origin on the mastoid process by a very short incision. All tight bands are divided. The head is overcorrected and fixed in plaster, followed in two weeks by a celluloid fixation support.

One great advantage, especially in females, is the fact that the scar lies behind the ear and is obscured by the hair.

Lange has used the method for years with excellent functional results and no recurrence.—*Henry O. Feiss, Cleveland.*

371.—**On Recurrence Following Operation for Torticollis.** By A. Schanz. Dresden. *Zeit. f. orth. Chir.*, Bd. XIII, Heft 4.

Two possibilities, either the unsatisfactory result following because the operation on the shortened parts was not thorough enough or because a process following the operation interfered with the result hoped for. This process is the formation of bands. If these were not present or if they were so long that they did not interfere with the normal movements of the neck, the operation may be said to have achieved its aim. These bands can be made sufficiently long if we keep the upper stump of the muscle far enough up. We do this by means of some appliance such as a plaster bandage, but simpler than this is a thick cotton bandage applied according to description given by writer. Such a bandage serves not only as elastic pressure against the muscle ends but also as an efficient extension for the neck.—*Henry O. Feiss, Cleveland.*

372.—**Contribution to the Surgery of the Spinal Cord.** By F. Selberg, Abstract from *Jour. Am. Med. Assoc.*, Nov. 19, 1904, Vol. XIII, No. 21; from *Beitr. z. Klin. Chir.*, Vol. XLIII, No. 1.

Surgery of the Spine.—One of the four cases described was an extradural lipoma causing compression of the spinal cord, one was a tuberculous meningitis, another spondylitis, and another a sarcoma in the pia. The focus was freely exposed and excised and the patients with the lipoma and the tuberculous spondylitis were permanently cured. Every progressive tumor in the spine should be operated on, as the outcome is otherwise fatal, but the prospects of success are not always certain. Only a few tumors in the spine are capable of being radically removed. When the cord is involved the growth is inoperable. But when a lipoma, fibroma, psammoma, echinococcus, or exostosis has developed and compresses, but does not encroach on the cord, success may be counted on. Mere diagnosis of the segment affords no information as to this point. The first symptoms of a surgical spinal affection may be restricted to simple bladder disturbances. The pains are often taken to be sciatica or intercostal neuralgia.—*Robert B. Osgood, Boston.*

373.—**Cravatte for the Treatment of Cervical Spondylitis.** By J. Vuellers. *Zeit. f. orth. Chir.*, Bd. XIII, Heft 4.

The aim of the modification is to permit downward movement of chin without impairing the usefulness of the apparatus.—*Henry O. Feiss, Cleveland.*

SCOLIOSIS

374.—**Scoliosis Therapy.** By K. Gerson. Berlin. *Zeit. f. orth. Chir.*, Bd. XIII, Heft 4.

Hoffa showed that during forward bending, the anterior rib prominence became more marked in the course of the usual exercises. Writer describes a machine for swinging the trunk of the patient forward at the same time correcting the forward prominence by means of pressure.—*Henry O. Feiss, Cleveland.*

375.—**A Simplified Scoliosis Apparatus.** By Heine. *Zeit. f. orth. Chir.*, Bd. XIII, Heft 4.

Description of an apparatus modified from one of Beely's, the principle of modification being that short forcible redressments are more effective than those which are more prolonged and less intense.—*Henry O. Feiss, Cleveland.*

376.—The Decimetric Screen. By Oskar v. Hovorka. *Zeit. f. orth. Chir.*, Bd. XIII, Heft. 2–3.

Photograph taken through a wire netting in which the wires are 5 cm. apart and every other one thicker.

The patient is placed in a position in which the mid-wire coincides with the line between the two points, *viz.*, the upper end of the fold of the buttock and the vertebra prominens. This gives the patient a standard attitude.—*Henry O. Feiss, Cleveland.*

377.—Apparatus for Treating Spinal Curvatures. By Schultze. Duisberg. *Zeit. f. orth. Chir.*, Bd. XIII, Heft. 2–3.

Patient laid on table for the purpose, the part to be corrected on padded pedestal which may be mechanically raised in the sense of correction, while extension is exerted on head and pelvis.—*Dr. Henry O. Feiss, Cleveland.*

378.—A Detorsion Attachment for the Hessing Scoliosis Corset. By C. Wahl. *Zeit. f. orth. Chir.*, Bd. XIII, Heft 4.

This is a modification of the Hessing corset, consisting of a horizontal steel band running from one of the lateral uprights to the posterior rib prominence and bent so that a pad at its end will exert pressure upon the deformity.—*Henry O. Feiss, Cleveland.*

379.—The Relation Between Flat-foot and Scoliosis. By Denis G. Zesas. *Zeit. f. orth. Chir.*, Bd. XIII, Heft 4.

Zesas reports on 150 cases: 102 present flat feet and 48 normal feet. Of the 102 flat-foot cases, 25 were of the right, 15 of the left and 62 of both. These results correspond with the works of other investigators, showing that scoliosis tends to double flat-foot for the greater part. It must be looked upon as an accompaniment in the greater number of cases of scoliosis, but presents no static factor in the etiology.—*Henry O. Feiss, Cleveland.*

380.—Location of Scoliotic Deviations at Various Ages. By Ernst Mueller. Altdorf. *Zeit. f. orth. Chir.*, Bd. XIII, Heft 4.

A compilation of statistics of Schulthess' 1140 cases (*Zeit. f. orth. Chir.*, Bd. X) tabulated for each year from eight to eighteen. The result of this work brings out the following facts:

1. The general frequency of the observed cases rises steadily from the eighth to the fourteenth year and then diminishes.
2. If we compare the eighth to the seventeenth year then the frequency maximum of the right convex deviation always shows itself at the sixth or the eighth dorsal vertebræ.
3. The frequency maximum of the left convex deviation is at the eighth year about at the eighth or the tenth dorsal vertebræ, falls at the fifteenth year to the first or second lumbar vertebræ and remains there in the following years.
4. The frequency of the left convex scoliosis diminishes with few exceptions from the eighth to the seventeenth year but that of the right convex increases: at the fourteenth year they are equally divided. The number of compensatory curves increase steadily from the eighth to the seventeenth year. The increase depends chiefly on the left convex compensatory curves.—*Henry O. Feiss, Cleveland.*

381.—Clinical Studies of Dorsal Scoliosis. By S. Samu Hoffmann. Budapest. (From the Clinic of Lüning and Schulthess.) *Zeit. f. orth. Chir.*, Bd. XIII, Heft 1.

Investigation made to find if dorsal scoliosis including cervico-dorsal scoliosis persists, or if it changes, what new forms develop. Only such cases as were under observation over one year and were measured more than once. One hundred and sixty-six cases selected—52 simple, 105 complicated and 9 cervico-dorsal curves. Results:

1. *Deviation Changes.*—Simple dorsal scoliosis almost always persists. Complicated curves and cervico-dorsal curves have more tendency to deviate.
2. Lateral displacement (of vertebra prominens from mid-sacral perpendicular line) seldom remains the same.
3. *Amount of Maximum Deviation.*—Cervico-dorsal and simple dorsal curves have greater tendency to improvement than the complicated forms.
4. *Transference of Maximum Deviation.*—More often downward than upward.
5. *Compensatory Curves.*—Mostly dorso-lumbar.
6. *Torsion.* In the simple dorsal scoliosis torsion persisted in 62 per cent.; in complicated dorsal, it persisted in 67 per cent. and in cervico-dorsal in 63 per cent.—*Henry O. Feiss, Cleveland.*

382.—**Further Contributions to the Subject of Scoliosis after Sciatica.** By H. Ehret. *Mittheil. aus d. Grenzgeb. d. Med. u. Chir.*, Band XIII, Heft 1.

The author attributes scoliosis after sciatica to permanence of spinal adaptation to that position of the hip in which the sciatic nerve is freed from pressure and pull, *i. e.*, a position of flexion, abduction and external rotation. This position results in a depression of the pelvis on the affected side, a slight flexion of the knee on this side to neutralize the practical lengthening of the limb, and usually a compound lateral curvature with the lumbar convexity toward the affected side. When, however, the nerve irritation extends up into the lumbar plexus, elongation of the muscles of the flank on the affected side is resisted and the lumbar spine assumes a concavity toward the affected side. As prophylaxis is suggested confinement in bed as long as sciatic pain continues with the knee on the affected side held sharply flexed by a silicate bandage, thus discouraging spinal compensation. A remaining scoliosis after the sciatica has gone is to be combated by a high sole on the side previously affected.—*William E. Blodgett, Detroit.*

HIP.

383.—**The Mechanical Treatment of Hip Disease.** By Adolph Lorenz, Vienna. *Jour. Am. Med. Assoc.*, Vol. XLIV, Feb. 4, 1905, No. 5.

Lorenz calls attention first to the end results of cases of untreated hip disease. The condition for which the patients are brought to the physician is the flexion-adduction deformity which by an intra-articular modeling redressment or a central or subtrochanteric osteotomy is not difficult to correct.

Lorenz gives the history of a typical case of untreated disease, emphasizing the fact that abscess formation is probably no more frequent in these than in the treated cases, and that the bones are firm and capable of bearing weight, while the muscles are comparatively well developed. In short, that the result is not a poor one.

The author next considers the views of many of his colleagues, more particularly the American physicians, who believe that bed treatment, precise ambulatory splints, the removal of the body weight, and especially extension are required. He sketches the history of a case thus treated.

Comparing the end result with that of the untreated case, he finds nothing in favor of this prolonged mechanical method. The increased shortening from greater lack of growth, the more brittle bones, and more atrophied muscles, together with the resulting instability of the knee joint, he considers real disadvantages.

From the observation of cases, Lorenz concludes that the hip joint is sensitive to weight-bearing for only a very short period in the course of the disease, while it is extremely sensitive to motion throughout nearly its entire course. His principle of treatment, therefore, is to fix the limb in the early abducted position in a plaster-of-Paris spica short enough to allow knee motion. The child is encouraged to walk as long as this is painless. If treading is painful a leather splint is fastened to the spica; steel side pieces, jointed at knee and ankle, eliminate the jar in walking by means of a sole plate to which they are attached. When the sensitiveness to weight-bearing ceases the lower leg is given its freedom again, and massage and active abductive movements begun with caution, the aim being not to obtain more motion in the joint, but to improve the position of weight-bearing by abduction and extension.

These conclusions have been reached after fifteen years of experience with this treatment.—*Robert B. Osgood, Boston.*

384.—**The Cause and Treatment of Coxitic Contractures.** By R. Werndorff. *Zeit. f. orth. Chir.*, Bd. XIII, Heft. 2–3.

Various views as to the formation of contracture deformities. Clinically we have come to the conclusion that coxitis runs its course in two phases. In the first phase we have very marked pain in the slightest movements, whereas weight-bearing is relatively not sensitive. Pathological and clinical evidence shows that the abduction position is not sensitive to weight-bearing. The second phase is that of abduction. This is a clinical expression of the weight-bearing pains of the patient during walking. Causes.

Treatment of resultant contractures. Adduction is corrected by "modellierende redressement."

Abduction contracture is one to be desired.—*Henry O. Feiss, Cleveland.*

385.—**A New Abduction Arrangement for Hip Splints.** By J. F. Gottstein. *Zeit. f. orth. Chir.*, Bd. XIII, Heft 4.

Description of a mechanical contrivance for varying the angle of abduction. —*Henry O. Feiss, Cleveland.*

386.—**Bilateral Hip-joint Ankyloses.** By Joachimsthal, Berlin. *Zeit. f. orth. Chir.*, Bd. XIII, Heft. 2–3.

The two great disturbances in the above condition are in locomotion and in sitting. Most favorable for functional purposes, is to have the femurs parallel to each other and the hip-joint fixed at an angle of 30-40° because this renders sitting possible, and permits, on account of the obliquity of the femurs, the lower leg to be brought into action.

Resections or osteotomies may be done for this purpose. Report of a case —*Henry O. Feiss, Cleveland.*

387.—**The Operative Treatment of Bilateral Hip-joint Ankylosis.** By G. Drehman, Breslau. *Zeit. f. orth. Chir.*, Bd. XIII, Heft. 2–3.

We may do osteotomies or try to get movable joints by pseudarthroses. The question is discussed whether we gain more by bilateral pseudarthroses than by ankylosis in one hip and pseudarthrosis in the other.

Report of a case in which this latter measure was taken —*Henry O. Feiss, Cleveland.*

388.—**Coxa Valga.** By Turner, St. Petersburg. *Zeit. f. orth. Chir.*, Bd. XIII, Heft 1.

All causes which bring about inactivity of the lower extremity, and so remove the stress of weight-bearing from the head of the femur tend to bring about the condition of coxa valga.

To this may be added the downward pull, due to the weight of the hanging limb when it has no active function.

The Röntgen pictures, of the hips after leg amputations, infantile paralyses, luxations, etc., show this point.—*Henry O. Feiss, Cleveland*

389.—**Coxa Valga.** By Max David, Berlin. *Zeit. f. orth. Chir.*, Bd. XIII, Heft. 2–3.

Review of some of the literature and cases previously reported. Case here described of a primary, congenital, bilateral coxa valga, manifested functionally by a peculiar gait.—*Henry O. Feiss, Cleveland.*

390.—**Axillary Abduction in the Treatment of Congenital Dislocation of the Hip.** By Robert Werndorff, Vienna. *Zeit. f. orth. Chir.*, Bd. XIII, Heft 4.

This consists of fixing the thigh close to the trunk in the most extreme abduction. The knee comes under the axilla, and the thigh and the trunk are enclosed in one tube of plaster. Writer uses this axillary abduction only in cases which have been reduced at least once or twice, in which, in spite of prolonged fixation at right angles or still greater abduction, reluxation has taken place upward and forward. He has used it on eight cases. In four of them he has already been able to remove the plaster. In the other four treatment has not yet come to an end.—*Henry O. Feiss, Cleveland.*

391.—**The Reposition of Congenital Hip Dislocations.** By Hoeftman, Konigsberg. *Zeit. f. orth. Chir.*, Bd. XIII.

The difference between ordinary dislocation and congenital dislocation of the hip: In the former, the leg is rotated inward on account of the Y-ligament. In congenital dislocation, inward rotation does not take place, on account of the anteverted position of the head in relation to the neck, which may be so extreme, that the head may be directed forward as much as a right angle from the direction of the neck. As a result the foot is directed inward after reposition.

Therefore, in reducing, one must rotate the leg outward during hyperextension.—*Henry O. Feiss, Cleveland.*

KNEE.

392.—**Operative Methods—New and Old—in Tuberculosis of the Knee Joint.**

In an address before the Midland Medical Society, Sir William Thomson (*Brit. Med. Jour.*) speaks at some length on tuberculosis of the knee. He admits that by far the greater number of cases if seen early are amenable, in a certain degree, to mechanical methods, and with children of the better classes it is seldom necessary to interfere actively. But with the children of the poor, who are seen in such numbers in the out-patient departments of our large hospitals, it is a very different matter, since the wretched surroundings and lack of care which they receive, coupled with the infrequent visits to the hospital and incomplete supervision, far too frequently result in a joint which sooner or later passes out of the domain of nonoperative treatment.

In considering the various operative procedures, excision, injection, erasion and amputation are all taken up in more or less detail. In speaking of the operation of excision, the writer calls attention to the fact that up to fifty years ago, practically all advanced cases met a uniform fate in that they were at once amputated, and it was not until it began to be realized that limbs as well as life had value, that there arose a desire to preserve what had once been condemned. The first excision, however, was done long before this period, in 1782, in fact, by Park, of Liverpool. Following this, others came, yet up to 1816 but six cases had been recorded, and it was not until long after this that it came to be recognized as a rational surgical procedure, although even to-day, in England, it is not a popular operation. In speaking of injections, Thomson points out the theoretical difficulties in the way of obtaining good results, as well as the lack of rational basis for the procedure. Experience has proven that this form of treatment is unreliable and disappointing.

The operation of erasion has found favor in England, but for the reason that it is often difficult to thoroughly eradicate the disease even after this operation, as well as the fact that a very unstable joint frequently follows, Thomson regards the older operation of excision as far more advantageous in the majority of cases. In summing up he says that, "Excision is definite, comparatively short in treatment, very free from serious after complications, and quickly restores the patient to active life. Erasion is not definite, after-treatment is long, complications are always imminent and frequently develop, the patient is not speedily restored to active life, and, lastly, when the surgeon ceases to look for a movable joint, the whole position is surrendered to excision."—*Harold W. Jones, St. Louis.*

393. Treatment of Tuberculous Infection of the Knee-joint. By Rudolf Gerlach. Inaugural Dissertation, Goettingen, 1903.

The treatment of tuberculous knee-joint disease is conservative and operative. The former has reference chiefly to children. In isolated cases injections have had good results. The best of these is the iodoform emulsion in glycerin, 1:10. Operative treatment is applied in cases of adults. Resection takes the first rank. Amputation is not to be thought of except as an ultimate measure for prolonging life. Report is based on 216 cases. *Henry O. Feiss, Cleveland.*

394. The Pathogenesis and Therapy of Knee-joint Contractures. By K. Ludloff, Breslau. *Zeit. f. orth. Chir.*, Bd. XIII, Heft. 2–3.

Report to be read in connection with that of Mikulicz. *Loc. cit.*
Evidence based on a series of tracings of radiograms:

1. Neurogenous Contractures.

Paralytic.—Lowering of patella; atrophy of diaphysis; epiphysis of normal size; slight shifting of the axes of the bones; contracture; complete flexion but limited extension.

Spastic.—Right angle contracture; marked development of muscles, especially the flexors.

2. Tuberculous Contractures.

In children, enlarged epiphyses, with irregular new formation of bone; enlargement of patella; shifting of bone axes; little motion; in adults, slight contractures; partial bone destruction; without new formation; no subluxation, slight passive motion without spasm.

3. Gonorrheal Contractures.

Marked contracture; partial bone destruction, at the junction of bone with cartilage with bone; a little deposition of bone; no softening.

4. Osteomyelitic Contracture.

Right angle flexion, circumscribed bone-enlargement, free motion in small limits.

Deductions.

1. Knee contracture begins purely mechanically by passively assuming a mid-position, and this is modified later by weight-bearing and muscular action in functionating.
2. In all contractures, the age in which the contracture has started is of importance.
3. Contractures must be fought prophylactically above everything, as an adjustment for badly developed cases is not possible without open operation. —*Henry O. Feiss, Cleveland.*

395.—Peroneus Paralysis in the Treatment of Knee-joint Contractures. By Rudolph R. v. Aberle, Vienna. *Zeit. f. orth. Chir.*, Bd. XIII, Heft. 2–3.

Experiments on the cadaver showed that the peroneal nerve is tightly fixed to its surroundings at certain points which prevents tension from being transmitted further down in its course, while in the tibialis nerve, the stretching force is divided equally all along its course. Therefore certain parts of the peroneal nerve are subject to greater stretching than in the tibial nerve, and paralysis in this is more frequent.

There are two factors in the fixation of the nerve: (1) Connective tissue fixation of the trunk; (2) fixation on account of its branches. This second factor explains the frequent motor paralysis with sensibility intact.

In the correction of knee contractures we must remember that the nerve reacts not so much from the temporary stretching at operation as from the continuous maximal tension afterward. One principle is never to fix the limb in the best resulting position, but to lessen the tension. In extreme cases secondary operations are necessary later to get the result aimed at.—*Henry O. Feiss, Cleveland.*

396.—Congenital Knee Luxation Reduced by Open Operation. By Max Reiner. *Zeit. f. orth. Chir.*, Bd. XIII, Heft. 2–3.

Case presents a combination of deformities including congenital dislocation of right hip and dislocation of both knees. Reposition easily made and at the end of seven months there was little pathologic movement left.—*Henry O. Feiss, Cleveland.*

397.—A Case of Genu Varum Paralyticum. By J. Vullers, Dresden. *Zeit. f. orth. Chir.*, Bd. XIII, Heft 1.

The deformity took place as a result of the child's favorite sitting position in which the left lower leg was laid under the right thigh. The weight of the body fell on the left knee and so stretched the external capsule of the joint.—*Henry O. Feiss, Cleveland.*

398.—Ganglion on the Meniscus of the Knee. By Ebner. *Münch. med. Woch.*, Sept. 27, 1904, p. 1737.

Without previous injury a tumor slowly appeared on external aspect or knee until after five or six years it had attained the size of a pigeon's egg. It distorted the joint, prevented motion and caused severe attacks of pain. The operation revealed a ganglion on the external rim of the meniscus externus, 2 cm. above the insertion of the biceps. A résumé of literature is given.—*Walter G. Stern, Cleveland.*

399.—A Case of Old Supracondyloid Fracture of the Femur with Secondary Hemophilic Knee Healed by Oblique Osteotomy. By Ahrens, Ulm. *Zeit. f. orth. Chir.*, Bd. XIII, Heft. 2–3.

On account of poor alinement of the fragments, a thickening had formed above the knee-joint which caused congestion of the veins of the synovial membrane, which on account of its porosity and the hemophilic tendency of the patient, permitted effusion to take place easily.—*Henry O. Feiss, Cleveland.*

400.—Dislocations of the Patella with Rotation on its Horizontal Axis. By William S. Cheesman. *Ann. of Surg.*, Jan., 1905, Vol. XLI, No. 1.

The quadriceps tendon in a boy thirteen years old was completely ruptured by a train accident, and the upper margin of the patella turned down into the cleft between the femur and the tibia, without lateral displacement. Manipulative reduction with an anesthetic proved impossible. Semicircular flap exposing capsule was made two days later, and the patella was pried into by a blunt dissector inserted through a slit near the ligamentum patellæ. Quadriceps tendon sutured with chromicized gut. Passive motion on twenty-third day. In two months, perfect union and mobility. The five other cases in the literature reviewed.—*William E. Blodgett, Detroit.*

FOOT.

401.—On Pain in Sole of the Foot and its Treatment (Podalgia, Plantar Neuralgia, Tarsalgia, Metatarsalgia, Talalgia, Pain in Heel). By F. Franke. *Deut. med. Woch.*, 51 and 52.

Franke comments upon the scarcity of literature on this subject and considers that pain in the sole of the foot, for the most part, is due to: (*a*) Flat foot; (*b*) swellings (tumors) in sole of foot; (*c*) inflammatory and traumatic diseases, especially of the ligaments, tendons and bursa of the sole of the foot, bones of the foot, and soft parts; (*d*) diseases of the nerves, and (*e*) gout. Not all of the pain in the sole of the foot is due to flat-foot by any means, as is commonly supposed. Franke briefly considers (*a*) and (*b*). Inflammatory conditions appear now and then primary or in connection with injuries of the foot or infectious diseases. They develop in the soft parts of the foot, especially the plantar fascia or in the tendinous or connective-tissue portions in direct connection with it. The inflammation may be acute or run a chronic course. Franke has seen several cases of pain in sole of the foot where there was an inflammation of the plantar fascia or formation of nodules on or in the proximity of its inner border, painful on pressure, or in the connective-tissue tendons, and fascia following influenza. Other infectious conditions as rheumatism, typhoid, gonorrhea, and many more, may also be causes. Pain in sole of the foot may result from osteo-periostitis of bones of the feet (os calcis, cuboid, metatarsus, scaphoid). Franke has several times observed a peculiar form of ostitis following influenza. The ostitis was accompanied by an inflammation of the surrounding connective tissue which ran a slow course and involved the plantar fascia and neighboring nerves in sympathy. A pain in heel quite similar to that seen in the plantar fascia and under the ball of the great toe, quite typical, at least in severe cases, may exist. The pain is most disagreeable on standing and is rarely spontaneous, usually demonstrable on pressure and often severe. The causes of this pain are various. It may arise from an inflammation of the plantar fascia, or of the periosteum of the os calcis or from a chronic osteo-periostitis of the os calcis or a bursitis of the bursa under the os calcis. Franke has never found gonorrhea in this latter condition and in one case there were signs of influenza present as well. It may also arise from the tendons in the region of the heel or from the insertion of the tendo Achillis. Franke considers this inflammation almost without exception to be a result of influenza. Injuries in the region of the heel, such as a fracture of the bones of the heel, through formation of callus and by compression or other irritation of the surrounding parts may cause pain in heel. Certain cases of pain in sole of foot and heel are purely nervous with no objective symptoms (occupation neuroses, occupation pain). Some authors attribute this to neurasthenia, anemia, and chlorosis. Franke, however, does not think so, but thinks in a great number of cases a neuritic process is at the bottom. He has found almost always that in these cases pressure on a plantar nerve, posterior tibial, and sometimes sciatic is painful. It is usually double and occasionally accompanied by other nervous phenomena. Franke considers this condition almost without exception to be due to an influenza neuritis. It may be seen in typhoid convalescence tabes, dementia paralytica, etc. Children are seldom affected, although Franke has seen it several times in children. He next discusses Morton's disease and thinks it is due, to a neuritis, and which in his own case followed influenza. Ostitis of the metatarsus is another cause. He considers briefly gout and gouty deposits in the sole of the foot and has never seen a case of neuritis or neuralgia in this region due to gout. Nevertheless gout must be thought of in making a diagnosis. In conclusion Franke considers that a minute examination of the sole of the foot and of the rest of the body, an exact clinical history of the case, as well as a careful consideration of all the possible causes, is most important. In addition he advises testing the plantar nerve and its branches for any sensitiveness to pressure, and being on the watch for any previously existing infections, particularly influenza. The treatment is to find the cause of the pain and then to eradicate it, and he discusses the treatment of the various conditions described in his article.—*David Townsend, Brookline, Mass.*

402.—**Treatment of Static Flat-foot by Redressement Forcé and Tendonplastic.** By F. Schultze, Duisberg. *Zeit. f. orth. Chir.*, Bd. XIII, Heft. 2–3.

Summary by Author.—Static flat-foot may be corrected to indications in the first thirty or forty years. Conservative treatment is not to be recommended in youth except in the less marked cases. In correction, we readjust the bones and the muscles. This can only be done by lengthening of the tendo Achillis, followed by typical redressment. In cases of contracture, tenotomies of the extensor digitorum and extensor hallucis are necessary. An ambulatory plaster in overcorrected position aids the result in no slight degree.—*Henry O. Feiss, Cleveland.*

403.—**Radical Cure of Rachitic and Static Flat-foot by Means of Tendoplasty.** By Imre Hevesi, Klausenburg. *Deut. med. Woch.*, Nov. 3, 1904.

Hevesi considers the changes occurring in flat-foot and the pathologic anatomy, and concludes that true flat-foot is a change not only in the form of the bones but also in their relation to each other and to the lower leg. In addition to the various methods of correction of flat-foot, manual reduction, bone operations, etc., several authors—Hoffa, Müller, Franke and others—have recommended tendon operations. Hevesi describes his own method. In cases where the foot is more or less fixed and where the individual parts of the deformity are so developed that a restoration to the normal position is impossible, he employs, first, complete mobilization, which he carries to the point where the foot can be easily overcorrected. As soon as swelling and circulatory disturbances have ceased he undertakes his bloody operation. He separates a slip from the inner side of the tendo Achillis, through an open incision; the rest of the tendon he lengthens by two or three inches on each side. This allows dorsal flexion and supination of the foot. Next he slits the sheath of the posterior tibial longitudinally upward and shortens the tendon as much as possible by means of a reef suture. He then stitches the slip of the tendo Achillis to the tendon of the posterior tibial with a heavy silk suture. Next he makes a cut from the heel to the middle of the foot on the inner side and frees the anterior tibial from its insertion. A canal, the size of a lead-pencil, is bored through the navicular bone from the inside above to the outside below. The tendon of the anterior tibial is then drawn through this canal by means of a silk suture interwoven into the end of the stump. As much tension as possible is used in pulling the tendon through the canal, so that the bone of itself is pushed upward. By this means the arch of the foot is restored and held in position. In order to prevent relapse it is well to wrap the pendant end of the tendon about the bone, on the medial side, and to make the same fast, by means of a silk suture, on the periosteum, the tense ligaments, and on the tendon itself. To aid the anterior tibial in its work Hevesi cuts the extensor hallucis across, in the lower leg, and transplants the central stump to the anterior tibial and the peripheral stump to the extensor communis digitorum. The tendon sheaths, fascia, and skin are then sewed up with silk. The overcorrected foot is put up in two plaster splints enclosing the leg and foot and extending from the toes to the knee, and so arranged that either portion may be removed without disturbing the position of the foot. These he keeps on from three to four or five weeks, when he takes out the stitches and applies a flat-foot shoe, which he describes. Hevesi operated upon five cases by this method and describes in full four cases in which the procedure was partly modified and partly extended. He concludes the article with a general discussion of the subject.—*David Townsend, Brookline, Mass.*

404.—**Therapy of Flat-foot.** By Antonelli, Pavia. *Ziet. f. orth. Chir.*, Bd. XIII Heft 4.

Activity of muscles is the greatest factor in maintaining the plantar arches and it is in muscular weakness that we must look for the cause of static flat-foot. The object should be to strengthen the longitudinal and transverse arches, to increase the activity of the supinators and to lessen that of the pronators.

These things are accomplished by carrying the tendon of the extensor proprius hallucis beneath the plantar arches and fixing it, by lengthening the tendo Achillis, by increasing the tension of the tibialis posticus, by diminishing that of the peroneus and by transferring the activity of the long extensor tendon of the second toe to the first toe.

The technic of these measures is carefully described.—*Henry O. Feiss, Cleveland.*

405.—**Pes Valgus.** By C. Hübscher, Basel. *Zeit. f. orth. Chir.*, Bd. XIII, Heft 1.

Writer's Summary.—1. Pes valgus, the forerunner of flat-foot, results, except in the traumatic cases, from a habitual pronation in the ankle-joint.

2. This position of pronation is caused by an insufficiency of the supinators, which no longer bring the foot into the line of weight-bearing.

3. The causes of this insufficiency are: A change in relation between body weight and development of muscles, general constitutional weakness, local weakness in muscles due to phlebitis and varices, nonadaptability of the foot to increased weight and comfort, etc.

4. An apparent index of this insufficiency is the defective function of the flexor hallucis longus.

5. Every patient who complains of foot disability is to stand upon a table and to be examined with a plumbline as to the valgus position of the calcaneus.

6. The pronation angle determined with plumbline is to be corrected chiefly by an inclined plane within or outside of sole which will supinate the foot to that degree as it had been pronated before.—*Henry O. Feiss, Cleveland.*

406.—**Hallux Flexus.** By Longuet, of Rouen. *Rev. d'Orth.*, 1904, No. 5, p. 385.

In this paper "hallux" applies to any toe and not to the great toe only. The subject is discussed in full, and following the article is a very long bibliography. The following kinds of cases are reported: Traumatic, neuroparalytic, dystrophic or senile, congenital and childhood cases. An army surgeon, Debaussaux, finds the affection in 1.65 per cent. of cases he examined for the army. These were in men of twenty years of age only. Longuet considers the affection as more common than these figures show.

Treatment consists of massage, manual correction, apparatus and operation. However, amputation and tenotomy or teno-aponeurotomies should never be practised.

Each of the four types has its distinct causes, symptoms, allied lesions, and treatment. The congenital form has several clinical types: Flexus, biflexus, flexus valgus or varus, and the slight hook and complete hook. There is generally slight subluxation accompanying the hallux flexus with retraction of the fibrous attachments. Dr. Longuet, instead of using double epiphyseal resection, substitutes semiarticular cuneiform resection. This he considers simple, easy and rational.—*Robert Soutter, Boston.*

407.—Therapy of Congenital Club-foot in the First Weeks After Birth.
By J. Finck. *Zeit. f. orth. Chir.*, Bd. XIII, Heft. 2–3.

1. Manual redressment.
2. Application of bandage in an original manner so as to overcorrect, using a sole-piece which is bent over inner border of foot.
3. Subsequent correction. After original redressment three to four days elapse, then bandage re-applied daily.
4. At the end of one month a period of rest in which foot is simply fixed.
5. After-treatment. Braces and massage.—*Henry O. Feiss, Cleveland.*

408.—The Combined Use of Plaster of Paris and Elastic Traction in the Treatment of Deformities of the Feet.
By Charles B. Nancrede, Ann Arbor, Mich. *Jour. Mich. State Med. Soc.*, Dec., 1904, Vol. III, No. 12.

After forcible correction, preceded or not by tenotomy or the Phelps operation, according to the severity of the case, a wooden sole with a cross-piece is incorporated in the plaster cast, and, five or ten days later, varying with the nature of the operation, a segment of the cast above and on the outer side of (in equino-varus) the medio-tarsal joint is sawed out, and gradually increasing elastic traction is made on the sole-piece, so that further correction of the foot is effected. A strip of wire gauze is incorporated in the heel portion of the cast to serve as a hinge, and a few links of chain are partly buried in the upper part of the leg portion to give attachment to the elastic cords. The continuous traction thus secured exerts an absorptive pressure on the convexity of the deformity, greater than that exerted by intermittent forcible corrections; the traction, moreover, by removing compression on the concave side and producing hyperemia through stretching, favors elongation of this side. Using this method, the author has never had to resort to osteotomy.—*William E. Blodgett, Detroit.*

409.—Apparatus for Correcting the Equinus in Club-foot.
By Schultze, Duisberg. *Zeit. f. orth. Chir.*, Bd. XIII, Heft. 2–3.

It consists of two boards fastened with a hinge. Supination having been corrected, the foot is placed between the boards with heel toward hinge, and the sole against the upper board. This can now be closed toward the lower board which is fixed to the table and the sole of the foot thus pushed into overcorrection.—*Henry O. Feiss, Cleveland.*

410.—The Forcible Correction and Fixation of Club-foot.
By J. Ghiulamila, Bukarest. (Clinic of Hoffa.) *Zeit. f. orth. Chir.*, Bd. XIII, Heft. 4.

The methods of Koenig, Lorenz and Wolff embody the same principles. These are, 1, the redressment of the deformity and carrying the foot into normal or overcorrected position. 2. Fixation of the foot in this position for a certain length of time. 3. Dealing with the musculature and maintenance of the foot in its corrected position in relation to the whole leg until definite anatomic changes corresponding to new static conditions have been developed. Writer enters into a detailed and complete account of the technic. He describes the material for plaster bandages, application of the same, the manner of correcting, the trimming of the plaster, and the inconveniences. He leaves a plaster on a patient for at least two or three months and says that no interval should be permitted between plasters for fear of edema. If the case is an infant the change of plaster must occur every three or four weeks, but it cannot be left on very long on account of the growth of the limb.—*Henry O. Feiss, Cleveland.*

PARALYSIS.

411.—**The Recent Epidemic of Infantile Paralysis.** By R. B. Wade. *Australasian Med. Gaz.*, Sydney, July 20, 1904; abstr. from *Journ. Am. Med. Assoc.*

Wade details his observations made on 34 cases of epidemic infantile paralysis, 16 of them males and 18 females. The youngest patient was 13 months old, the oldest 7 years. In each case the onset was sudden, the disease being initiated by anorexia, fever and vomiting. In 2, the vomiting was absent; in 3, the attack was ushered in with fever, vomiting and diarrhea; in only 1 case were there convulsions, and this was in an epileptic; in 1, the paralysis occurred during pneumonia; in 1, during measles, and in only 1 case was there apyrexia. The fever in each case persisted for from four to ten days, ranging between 100 and 102. The most marked symptom was pain in the affected limbs, and this was present in 28 out of the 34 cases. Marked tenderness existed in the affected muscles and persisted for some time, in one case lasting two months, and in most cases from three to four weeks. In only 2 cases was tenderness absent. The muscles of the limbs which were affected in all cases, either alone or in conjunction with others, belong without exception to the extensor groups, and were the trapezius, supraspinatus and infraspinatus, deltoid, triceps and extensors of the fingers in the upper limb; while in the lower were the quadriceps, peronei and extensors of the foot. The flexors and adductors were never involved alone, but only as a part of the general paralysis of the limb. With the onset of paralysis the affected muscles became limp and flabby, but no wasting was noticed. A certain amount of recovery is the rule, but in every case there are some muscles or groups of muscles that show no indication of it. Recovery is slow, does not begin until about six weeks afterward, and in some cases improvement is still going on after four months. The superficial skin reflexes and the knee-jerks were present or not, according as their corresponding muscle was paralyzed or not. Kernig's sign was present in 3 cases; in each case the erector spinæ was involved. During the acute attack, before the onset of the paralysis, the essential factor to help in arriving at a diagnosis is the tenderness of the muscles. After the appearance of the paralysis, it has to be distinguished from multiple neuritis, which may be done by its acute onset, the want of symmetry and the permanency of the paralysis. The treatment must be expectant. When the paralysis is established, massage and the use of the constant current are indicated, but must be delayed until the tenderness has become diminished.

Litchfield gives a brief summary of 25 cases observed by him. The treatment consisted in keeping the paralyzed limbs warm, massage and measures to prevent deformity, the latter in some cases necessitating the use of splints.

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THE OFFICIAL PUBLICATION OF THE
AMERICAN ORTHOPEDIC ASSOCIATION

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The subscription price is five dollars ($5) a year, in advance. Subscriptions and applications for advertising space should be sent to the Chairman of the Committee, Dr. R. W. Lovett, 234 Marlboro St., Boston.

The Association does not officially indorse the opinions presented in the different papers published in this Journal.

VOLUME II OCTOBER, 1904 NUMBER 2

The American Journal of Orthopedic Surgery

THE OFFICIAL PUBLICATION OF THE
AMERICAN ORTHOPEDIC ASSOCIATION

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THE OFFICIAL ORGAN OF THE AMERICAN ORTHOPEDIC ASSOCIATION

Issued Quarterly. Subscription Price, $3.00 in Advance.

EDITORIAL COMMITTEE.
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H. AUGUSTUS WILSON, M.D., 1611 Spruce St., Philadelphia.
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EDITORIAL COMMITTEE
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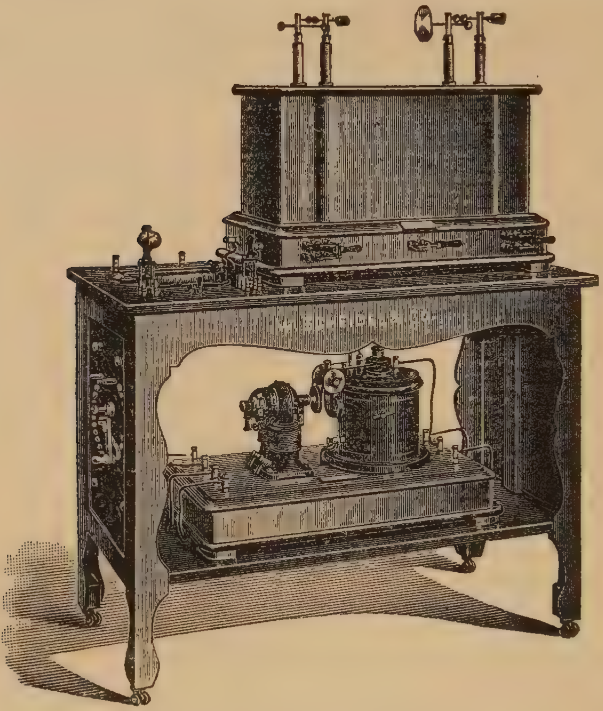

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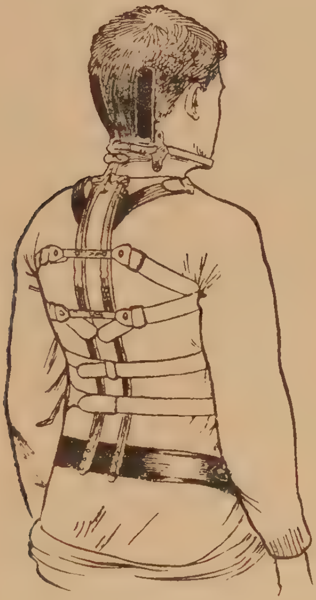

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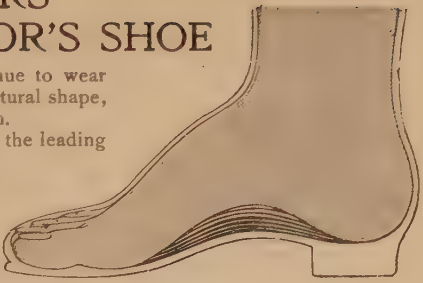

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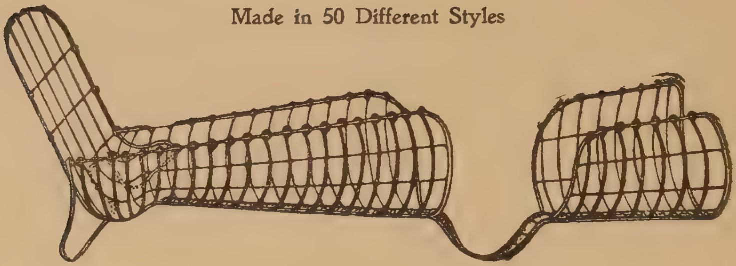

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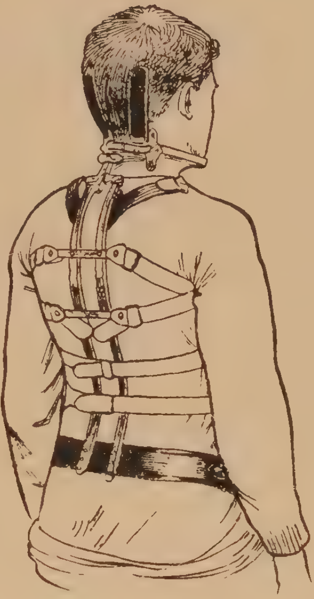

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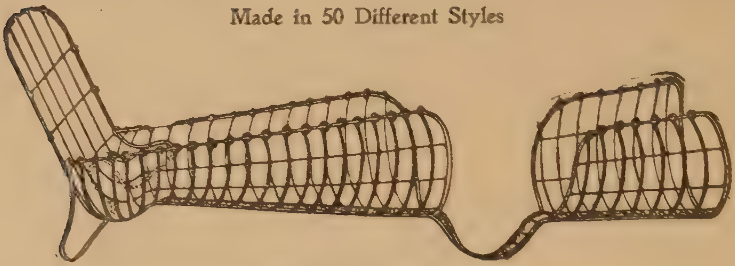

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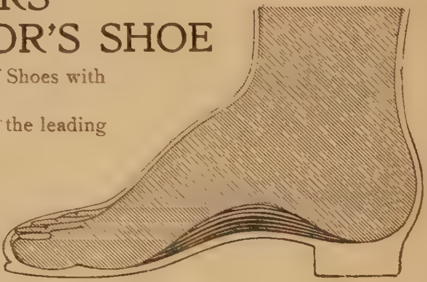

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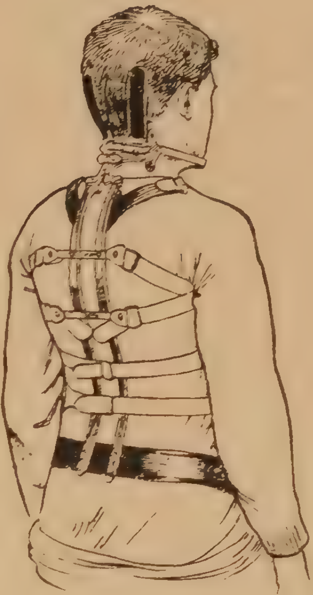

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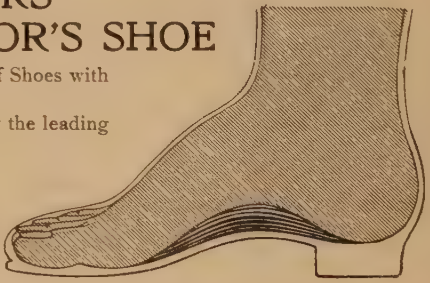

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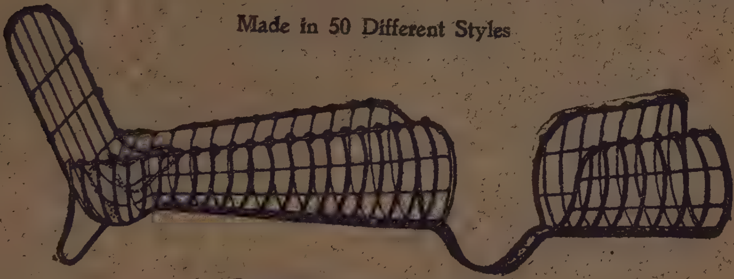

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